NUTRIENT SCHEDULING FOR BABY CORN (*Zea mays* L.) INTERCROPPED IN COCONUT GARDEN

by

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THESIS

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DECLARATION

I, hereby declare that this thesis entitled **"Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden"** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

Place : Vellayani

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CERTIFICATE

Certified that this thesis, entitled "**Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden**" is a record of research work done independently by Mr. Vinod Mavarkar under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to him.

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Vinod Mavarkar

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AE	Agronomic efficiency
ARE	Apparent recovery efficiency
B:C	Benefit cost ratio
BCR	Benefit cost ratio
CD (0.05)	Critical difference at 5 per cent level
cm	Centimeter
cm^2	Centimeter square
DAE	Days after emergence
DAS	Days after sowing
$dS\ m^{-1}$	Deci Siemens per metre
EC	Electrical conductivity
et al.	Co- workers/ co- authors
F	Fertilizer rate
Fig.	Figure
FYM	Farmyard manure
g	Gram
$g\ m^{-2}$	Gram per square metre
ha	Hectare
i.e.	that is
K	Potassium
KAU	Kerala Agricultural University
kg	Kilogram
$kg\ ha^{-1}$	Kilogram per hectare
LAI	Leaf area index
m	Metre
m^{-2}	per square metre
mg	milli gram

mg g^{-1}	milli gram per gram
Max.	maximum
Min.	minimum
MOP	muriate of potash
nos.	Numbers
N	Nitrogen
NS	Not significant
OC	Organic carbon
P	Phosphorus
PE	Physiological efficiency
PFP	Partial factor productivity
plant $^{-1}$	per plant
POP	Package of practices
pH	Negative logarithm of hydrogen ion concentration
RBD	Randomized Block Design
RH	Relative humidity
S	Significant
SE m	Standard error of mean
viz.	Namely

LIST OF SYMBOLS

%	per cent
^{0}C	Degree Celsius
@	at the rate of
^{0}B	Degree brix
₹	Indian rupee(s)

INTRODUCTION

1. INTRODUCTION

Maize, referred to as the 'queen of cereals' is one of the major grain crops with high yield potential, superior fodder quality and dual purpose value as compared to other food crops. Baby corn is one such dual purpose maize type, whose global spread, increasing demand and premium price has made it an attractive option for the farmers in many countries including India. Benefits accrued from it include increased income, increased crop intensity, added fodder production, employment generation and better nutrition. Baby corn (*Zea mays* L.) refers to the whole, entirely edible cobs harvested just before fertilization, at or just after the silk emergence stage (Galinat, 1985). It has the potential of producing high biomass within a short period of time and can also serve as a source of fresh fodder, especially during the summer months. The additional fodder value makes baby corn more profitable than grain corn and is more lucrative for the farmers of urban and peri urban areas (Pandey, *et al.*, 2000).

The corn ear used as vegetable is commonly referred to as 'baby corn'. The marketable baby corn cobs are light yellow colour with 10 to 12 cm in length and 1.0 to 1.5 cm in diameter (Muthukumar *et al.*, 2005). Further, it is also valued for its low calorie, zero cholesterol and high fibre content (Nagdeve *et al.*, 2014).

Cultivation of baby corn was initiated in Thailand in the early seventies for export purposes. Later on, other African countries also started to raise the tender and delicious baby corn crop. At present, Thailand and China are the leading countries in baby corn production. Cultivation of baby corn has spread to other Asian countries too in the recent years. In the last one and half a decades, baby corn has emerged worldwide as one of the high value crops due to its high nutritive value, exotic taste and most important to mention is the high demand among the urban and peri-urban population (Najeeb *et al.*, 2011). Baby corn has attracted attention on account of steady increase in demand and production over the recent years in India and due to its inherent ability to adapt itself to drought conditions (ICAR, 2012). In India, it is being widely cultivated in Meghalaya, Western U.P., Haryana, Maharashtra, Karnataka and Andhra Pradesh and to some extent in Tamil Nadu. However, baby corn production is not a popular venture among the Indian farmers mainly due to lack of awareness about the production package, economic importance and use of baby corn.

Kerala is characterized by extreme diversity in its physical resources and agro-climatic conditions with cropping intensity of 127.58 per cent (GoK, 2015). The land and climate of Kerala is suitable for a number of crops. About 45 per cent of the net area sown is under perennial crops like coconut. The agricultural scenario of the state is such that the frontier of arable land has almost been pushed to the limit. Hence, enhancing the productivity per unit area and time is of paramount importance. The change in cropping pattern and introduction of new crops ideally suited to the prevailing agro-climatic conditions is an important consideration. Studies conducted in Tamil Nadu and isolated pockets in Kerala, have shown that baby corn production could be an important on-farm income generation activity when intercropped with annual crops (Thavaprakash and Velayudham, 2008) and perennial crops like coconut (CPCRI, 2012). Baby corn is comparatively a new crop for Kerala and small farmers are often hesitant in trying new crops under sole cropping situations, since it involves certain degree of risk. Coconut occupies an area of 6.5 lakh hectares in Kerala (GoK, 2015). Studies undertaken at the Central Plantation Crops Research Institute (CPCRI) have revealed that a sole crop of coconut utilizes only 25 per cent of the soil effectively (Kushwah *et al.*, 1973). Thus coconut gardens provide ample scope for intercropping. However, intercropping options are meagre during the summer season due to dearth of irrigation. The shade and drought tolerance characters of baby corn could make it an ideal intercrop in coconut gardens during the summer season.

Baby corn production being a very recent development, cultivation practices, especially nutrient management needs to be standardized before it finds a prominent place in the existing cropping systems. In this context, an investigation entitled "Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden" was undertaken with the following objectives.

i. To standardise the nutrient schedule for baby corn intercropped in coconut garden.

ii. To work out the economics of the practice.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

Maize cobs harvested before fertilization within 3 to 5 days of silk emergence are referred to as baby corn. It is a dual purpose crop which provides green cobs for human consumption and fodder for livestock within 65-75 days after sowing. Baby corn is cultivated on a commercial scale in many parts of the world. Of late attention is being paid to explore its potential in India. Maize, being an exhaustive crop, much attention required in its nutrient management. The literature available on nutrient management in baby corn is limited. In this chapter an attempt has been made to compile the salient findings of earlier studies on nutrient management in baby corn.

2.1 BABY CORN

Baby corn is young flowering maize ears or female inflorescence. Though it is a kind of maize itself but differs in the way of economic product utilization and agronomic practices. It is harvested when ear is young, dehusked and desilked. The dehusked young ear is consumed as a vegetable and is used as raw material in canary industry.

Baby corn is also called vegetable corn as it is used as an ingredient in preparation *viz.*, Chol- suang (Chinese dish), soup, decorative crispy vegetable, in salads, pickles, corn pakora (Lekangul and Mathemm, 1994).

Baby corn being a relatively new introduction in our country, requires development of production technology especially intercropping with legume fodders in realizing higher ear production with good quality fodder. When intercropping is practiced with the objectives of realizing higher yield in food: fodder cropping system, adopting different planting pattern is another agronomic manipulation where two or more crops are accommodated (Pandey *et al.*, 1999).

The higher profitability of baby corn helps in increasing the profit realized by the farmers compared to grain corn. (Pandey *et al.*, 2000).

Ramachandrappa *et al.* (2004) suggested that harvesting corn for young, fresh, sweet and tender ears for vegetable purpose is a recent development in maize cultivation.

Baby corn cultivation provides options for crop diversification, value addition and income generation besides giving good quality green fodder, which adds to the total economic returns (Pandey, 2004).

2.2 EFFECT OF NITROGEN ON GROWTH, YIELD AND NUTRIENT UPTAKE

2.2.1 Growth and Growth Attributes

Deficiency or toxicity of any one of the essential elements can hamper the growth and yield of the crop. Nitrogen is the king pin among essential nutrients, which determine crop yield. Being a constituent of several cell components, nitrogen plays a vital role in metabolism and there by affect the growth yield and quality of crops.

Prasad *et al.* (1987) reported that increase in N application from 0 to 120 kg ha^{-1} and 0 to 150 kg ha^{-1} was observed to increase maize growth.

Nitrogen application increases the leaf area index, leaf area duration and photosynthetic efficiency and thereby influences the dry matter (Muchow and Davis, 1988).

Several scientists have reported significant increase in LAI with the application of increasing doses of nitrogen (Kumar and Bangarwa, 1997; Shivay *et al.*, 1999; Muniswamy *et al.*, 2007 and Suryavanshi *et al.*, 2008).

Shanti *et al.* (1997) observed that, among the five levels of nitrogen, application of 160 kg N ha^{-1} resulted in maximum leaf area index and dry matter accumulation per plant. They also observed delay in silking by 7.9 and 8.4 days with 120 and 160 kg N ha^{-1}, respectively.

Plant height, leaf area and dry matter accumulation in baby corn increased with nitrogen levels up to 150 kg N ha^{-1} (Thakur *et al.*, 1997). Similar results have been reported by Sahoo and Panda (1999) who observed significant increase in plant height up to 120 kg N ha^{-1}.

From their study conducted in silty clay loam soils of Akola, Bangarwa and Gaur (1998) observed significant increase in plant height (132.16 cm to 139.84 cm) and dry matter production of maize with increase in N dose from 40 to 120 kg ha^{-1}.

Plant height of baby corn was found to increase significantly up to 200 kg N ha^{-1} (Thakur and Sharma, 1999).

Shivay and Singh (2000) reported that application of 120 kg N ha^{-1} increased the plant height and dry matter accumulation in maize as compared to that at lower rates of application.

Pandey *et al.* (2000) observed significantly taller maize plants with 120 kg N ha^{-1} during the rainy season at Almora, while, Mishra *et al.* (2001) observed maximum leaf area index at 150 kg N ha^{-1} in conducted an experiment in *Rabi* season maize with 0, 75, and 150 kg N ha^{-1}.

Further, a significant increase in plant height of baby corn was observed with every increment dose of N up to 150 kg ha^{-1} in summer season and a similar response could be seen only up to 120 kg N ha^{-1} during the *kharif* season (Singh, 2001).

Dry matter production in maize increased up to 150 kg N ha^{-1} and was statistically at par with 180 kg N ha^{-1} both during *kharif* and summer seasons (Singh, 2001).

A study conducted by Vadivel *et al.* (2001) revealed that increase in nitrogen levels from 0 to 60 kg N ha^{-1} significantly enhanced the plant height, leaf area index and dry matter of maize. Similarly, Mohammoud and Sharnappa (2002) reported that maize recorded the maximum leaf area index 150 kg N ha^{-1}.

The field experiment conducted by Singh *et al.* (2003) in the clay loam soils at Varanasi exhibited that the plant height and dry matter production per plant of baby corn significantly increased up to 150 kg N ha^{-1}.

Increasing the levels of nitrogen from 75 to175 kg ha^{-1} recorded significant increase in the growth attributes *viz.*, plant height, number of leaves $plant^{-1}$, stem girth, leaf area index and dry matter accumulation $plant^{-1}$ in baby corn raised in the *alfisols* at Anand (Patel *et al.*, 2006).

The experiment conducted in small farmers fields by Tabu *et al.* (2006) revealed significant effect for N applied @ 60 kg ha^{-1} on the plant height and number of leaves $plant^{-1}$ as compared to its lower levels. Similarly, application of 120 kg N ha^{-1} resulted in significantly taller baby corn plants with the maximum leaf area index and dry matter production in contrast with the lower nitrogen levels (Bindhani *et al.*, 2007).

Further, Muniswamy *et al.* (2007), from their study conducted during *kharif* season, obtained taller plants and earlier appearance of silks with increase in nitrogen level from 80 to 160 kg ha^{-1}.

Application of 120 kg N ha^{-1} as urea and 30 kg N ha^{-1} as poultry manure improved all the growth attributes in maize (Kumar *et al.*, 2008).

The study conducted by Suryavanshi *et al.* (2008) on the effect of nitrogen on the growth of maize in the *vertisols* of Parbhani, revealed that the application of 150 kg N ha^{-1} resulted in significantly more plant height, leaf area index and total dry matter production as compared to application of 100 kg N ha^{-1}.

Nath *et al.* (2009) observed that application of 90 kg N along with 45 kg P ha^{-1} in sweet corn significantly increased the dry matter accumulation in sweet corn.

Maximum plant height and dry matter production were recorded in maize with the application of 225 kg N ha^{-1} (Bharathi, 2010).

2.2.2 Yield Attributes and Yield

Yield attributes, grain and stover yields of maize increased significantly up to 90 kg N ha^{-1} under rainfed condition and up to 135 kg N ha^{-1} under evenly distributed rainfall in *kharif* season maize raised in sandy loam soils at Karimnagar (Raju *et al.*, 1997).

Sahoo and Panda (1997) reported that application of 120 kg N ha^{-1} resulted in the significantly higher weight of baby corn without husk compared to other levels of N tried.

Application of 160 kg N ha^{-1} recorded significantly higher number of cobs per plant in maize and it remained at par with that of 120 kg N ha^{-1} (Shanti *et al.*, 1997).

Studies conducted by Thakur *et al.* (1997) in the alfisols of Bajura, Kullu Valley, Himachal Pradesh, revealed an increase in the number of baby corn cobs per plant with 200 kg N ha^{-1} compared to no nitrogen application. They also observed that baby corn cob weight with and corn weight (cob without husk) increased significantly with increase in N levels up to 100 kg N ha^{-1}.

Stover yields were observed to increase significantly with nitrogen up to 120 kg ha^{-1} (Bangarwa and Gaur, 1998; Ameta and Dhakar, 2000; Kar *et al.*, 2006 and Suryavanshi *et al.*, 2008).

Grain yield of maize was reported to increase to the tune of 61 to 137 per cent with increase in N levels from 75 to 250 kg ha^{-1} in the sandy loam soil at Hisar (Tyagi *et al.*, 1998).

Application of 120 kg N ha^{-1} resulted in significantly more number of longer and heavier baby corn cobs (Sahoo and Panda, 1999). They also reported significant increase in baby corn yield with increased levels of nitrogen from 80 to 160 kg ha^{-1}.

Significant increase was observed in the number of baby corn cobs per plant, length of baby corn, baby corn yield and green stover yield with the application of 200 kg N ha^{-1} as compared to 100 kg N ha^{-1} (Thakur and Sharma, 1999).

Pandey *et al.* (2000) observed that, the application of 120 kg N ha^{-1} enhanced the number of baby corn cobs per plant and cob weight significantly, while, the length of baby corn remained unaffected with increase in nitrogen levels from 60 to 120 kg N ha^{-1}.

Cob length and girth of sweet corn exhibited significant increase with increase in nitrogen levels from 0 to 120 kg N ha^{-1} (Raja, 2001).

Linear increase was observed in the grain yield of maize with increase in nitrogen levels, the highest being recorded with 150 kg N ha^{-1} (Kumar and Singh, 2002).

Field experiment conducted by Singh and Totawat (2002) revealed that 100 per cent recommended dose (90 kg N ha^{-1}) of N was required to yield more number of grains cob^{-1}, grain and stover yield, when compared with 50 per cent and 75 per cent of recommended dose of N. Similarly, significantly higher number of cobs per hectare, cob length and weight of sweet corn were reported by Sahoo and Mahapatra (2004), with increase in nitrogen was levels from 60 to 120 kg ha^{-1}.

Increasing the nitrogen level 20 kg ha^{-1} to 80 kg ha^{-1} was observed to enhance the cob length and cob girth of baby corn significantly (Kar *et al.*, 2006).

Significantly bigger cobs, more number of kernels cob^{-1}, kernel weight cob^{-1}, test weight, grain and stover yields were observed in maize by Singh *et al.* (2006) with the application of nitrogen at 180 kg ha^{-1} and remained on par with 210 kg ha^{-1}.

Bindhani *et al.* (2007) reported 178.7 per cent increase in baby corn yield with the application of 120 kg N ha^{-1} compared to no nitrogen application.

Muniswamy *et al*.(2007) observed significant increase in the number of cobs per plant with 160 kg N ha^{-1} as compared to 80 kg N ha^{-1}.

Application of 120 kg N as urea in conjunction with 30 kg N as poultry manure had significant positive effect on all yield attributes of maize *viz*., number of cobs per plant, length of cob, no of grains per cob and test weight (Kumar *et al.*, 2008).

Kumar (2009) reported that increasing the nitrogen levels from 0 to 120 kg ha^{-1} resulted in 185.5 per cent increase in the green stover yield. While, significant increase was observed in the cob length (11.6 per cent) and cob girth (16.9 per cent) of sweet corn with 70 kg N ha^{-1}, cob girth alone showed significant positive response to increase in nitrogen level up to 110 kg ha^{-1} (Nath *et al.*, 2009).

Baby corn weight, cobs per plant and baby corn girth increased significantly with 180: 38.7: 74.7 kg NPK ha^{-1} compared to 60: 12.9: 24.9 kg NPK ha^{-1} (Singh *et al.*, 2010).

Studies undertaken by Singh *et al.* (2015) revealed that grain yield of maize increased significantly with the application of 200 kg N ha^{-1} than 100 kg N ha^{-1}.

2.2.3 Nutrient Uptake

Nutrient uptake is a function of nutrient concentration in plants and the dry matter production.

Selvaraju and Iruthayaraj (1994) observed significantly higher nitrogen uptake at 175 kg N ha^{-1} when compared the lower doses of nitrogen.

Increase in levels of nitrogen up to 100 kg ha^{-1}showed significant increase in uptake of nitrogen (Singh *et al.*, 2000). However, the increase in nitrogen uptake was only marginal up to 200 kg N ha^{-1}, while, nitrogen and phosphorus uptake increased significantly with 100 per cent recommended dose of nitrogen and phosphorus (Kumaresan, 2001).

Parmar and Sharma (2001) and Kumar *et al.* (2008) observed significant increase in nitrogen uptake with 120 kg N ha^{-1} in maize.

Field experiment conducted by Sofi *et al.* (2004) revealed that application of nitrogen and potassium @ 160 and 80 kg ha^{-1} respectively, resulted in significantly higher nutrient uptake in maize.

Application of NPK @ 180:90:60 kg ha^{-1} recorded significantly higher nutrient uptake when compared to lower doses of 120:60:40 kg NPK ha^{-1} and 60:30:20 kg NPK ha^{-1} (Sutaliya and Singh, 2005).

Kar *et al.* (2006) observed a linear increase in nitrogen uptake by grain and stover with each successive increase in nitrogen levels.

Sahoo and Mahapatra (2007) reported significant increase in uptake of nitrogen, phosphorus and potassium in sweet corn with the application of 120:26.2:50 kg NPK ha^{-1}.

Significant increase in nitrogen content was observed both in baby corn and green fodder by increasing the nitrogen levels up to 120 kg ha^{-1} (Bindhani *et al.*, 2007; Kumar, 2009).

2.3 EFFECT OF PHOSPHORUS ON GROWTH, YIELD ATTRIBUTES AND YIELD

Phosphorus is a macronutrient which assumes paramount importance in metabolic activities (Havlin *et al.*, 2013). Phosphorus is an integral part of DNA and RNA, the two genetic entities that are required for the growth and reproduction of living organisms. Phosphorus containing compounds *viz.*, adenosine diphosphate (ADP) and adenosine triphosphate (ATP) provide internal energy to organisms. Thus deficiency of phosphorus will hamper RNA synthesis and thereby affect protein synthesis and lead to depressed growth (Hue, 1995).

2.3.1 Growth and Growth attributes

Bothe *et al.* (2000) observed significantly taller plants of maize with 75 kg P_2O_5 ha^{-1} and plant height was found to increase with increase in P from 0 to 75 kg P_2O_5 ha^{-1}.

Pellerin *et al.* (2000) reported a reduction in the leaf area index in P deficient maize plants due to reduction in the development of adventitious roots. This in turn had negative effect on PAR absorption and plant nutrition.

The importance of sufficient amounts of P in the plant tissue for propmoting early growth of corn was pointed out by Grant *et al.* (2001). Shabtai *et al.* (2006) observed that deficiency of phosphorus in the early stages could not be compensated by application of phosphorus in the later stages. Phosphorus has also been noted for its effect on harvest index more than whole crop yield. Phosphorus deficient maize plants recorded reduced leaf area index due to the delayed appearance of leaves and reduction of their final surface area.

Maqsood *et al.* (2001) observed significant effect for nitrogen and phosphorus on plant height. They reported maximum plant height with 150:120:60 kg NPK ha^{-1}.

Application of higher levels of phosphorus increased the leaf area per plant significantly (Alias *et al.*, 2003)..

Experiment conducted by Kumar *et al.* (2007) revealed significant positive effect for increasing levels of NPK application on the growth parameters of sweet corn *viz.*, leaf area index and total dry matter production. The highest leaf area index was recorded with 100 per cent recommended dose of N + 100 per cent recommended dose of P + 125 per cent recommended dose of K.

Application of phosphorus at 120 kg ha^{-1} recorded significantly higher leaf count compared to that recorded at 90 kg P ha^{-1} (Khan *et al.*, 2014).

2.3.2 Yield and Yield Attributes

The effect of phosphatic fertilizers at higher levels in increasing plant height, grain yield, biomass yield, number of grains ear^{-1} and P uptake efficiency of maize has been reported by Okalebo and Probert (1992) and Sahoo and Panda (2001).

Khot *et al.* (1997) reported that the green stover yield of corn increased significantly with increasing levels of P fertilizer.

Dry matter production of maize increased significantly with increase in levels of phosphorus up to 60 kg ha^{-1} (Bhagwan *et al.*, 1997).

Experiment conducted by Maqsood *et al.* (2001) showed that application of nitrogen and phosphorus had significant effect on the yield components *viz.*, number of cobs per plant, test weight and grain yield.

The number of kernels cob^{-1} and test weight of maize increased significantly at higher levels of P (Alias *et al*, 2003).

Phosphorus application @ 75 kg P_2O_5 ha^{-1} had significant positive effect on plant height, number of cobs $plant^{-1}$, grains cob^{-1}, grain weight cob^{-1}, test weight, grain yield and stover yield of maize (Khan *et al.*, 2005).

Mahala *et al.* (2006) observed significant increase in yield components, grain yield and stover yield of maize when P level was increased up to 60 kg P_2O_5 ha^{-1}. However, phosphorus uptake was observed to increase significantly up to 80 kg P_2O_5 ha^{-1}.

The study conducted by Suryavamshi *et al.* (2008) to assess the effect of phosphorus application in maize grown in vertisols with medium available phosphorus, exhibited that higher yields of maize could be achieved with 67.5 kg P_2O_5 ha^{-1}.

Yield and quality of stover was observed to increase significantly with increase in P levels up to 53 kg ha^{-1} (Rashid and Iqbal, 2012). They also observed that the phosphorus content, crude protein, crude fibre and ash contents increased up to 57 kg phosphorus ha^{-1}.

2.4 EFFECT OF POTASSIUM ON GROWTH, YIELD ATTRIBUTES AND YIELD

Potassium, referred to as the soldier nutrient, is the third major plant nutrient. Potassium is required for many vital functions. Hence it is required in large quantities by maize. Potassium is involved in enzyme activation, regulation of stomatal movement in leaves and carbohydrate translocation (Streeter and Barta, 1984).

Application of potassium at 67 kg ha^{-1} recorded maximum grain yield and fodder yield when compared with no application of potassium, with a crop response of 39 kg grain kg^{-1} K_2O (Roy and Kumar, 1990).

Study conducted by Al Zubaidi and Al Semak (1992) revealed significantly higher the dry matter production with application of potassium. Further crop response to K application was more in sandy loam than silty loam soils.

The experiment conducted in *alfisols* of northern Karnataka by Prasad (1993) showed that significantly higher the grain and fodder yield could be realized with the application of 75 kg K_2O ha^{-1}.

Application of potassium @ 120 kg ha^{-1} recorded significantly higher grain yield and test weight. However, the highest dry matter production was observed with 80 kg K_2O ha^{-1} (Sharif and Hussain, 1993).

Akhtar *et al.* (1999) reported that application of potassic fertilizers recorded higher yield, number of kernels cob^{-1}, cob length and girth, test weight and grain weight cob^{-1}.

Studies conducted by Chaudhry and Malik (2000) showed that cob yield, stover yield and protein content were significantly affected by application of potassium and the other growth and yield attributes like plant height, days to tasseling and silking, cob length, test weight and number of kernels cob^{-1} remained unaffected.

Kuan *et al.* (2000) observed that application of potassium @ 150-169 kg ha^{-1} had significant effect on grain yield and net income, with a crop response of 10.8 kg kg^{-1} K_2O.

Rehm and Lamb (2004) and Kaiser *et al.* (2005) observed that higher K uptake at younger stage of maize plant did not reflect on the grain yield of maize.

Study conducted by Bruns and Belhal (2006) revealed that the effect of potassium application on the concentration of other nutrients was limited, especially when the soil K was sufficient. However, they observed residual effect for the added K on the succeeding crops.

2.5 EFFECT OF SPLIT APPLICATION OF NUTRIENTS

Nutrient application in splits ensured continuous and gradual supply of nutrients to the growing crop. Split application of N and K might have improved their absorption and assimilation. Application of N and K at stages other than the critical growth stages might have caused the crop to be under stress and deprived it of sufficient nutrients at different growth stages. This in turn might have decreased the enzyme activation and photosynthesis, as explained by Evans and Wildes (1971)

Nair and Singh (1974) suggested the possibility of accumulation of late applied nitrogen in the vegetative parts, rather than in the sink.

Misra *et al.* (1994) reported that split application of nitrogen assured the crop with continuous supply of nitrogen so that leaf greenness could be retained longer ensuring better dry matter accumulation and consequently higher cob yield. Similar results have been reported by Parthipan (2000).

Muthukumar *et al.* (2007) observed that split application of nitrogen resulted in significantly higher green cob yield and enhanced the starch and protein contents of baby corn.

Saleem *et al.* (2011) reported taller plants and longer cobs with split application of potassium.

2.4 EFFECT OF NUTRIENT SCHEDULE ON ECONOMICS

Thakur and Sharma (1999) observed an increase in the returns per rupee invested with increase in N application from 100 to 200 kg ha^{-1}.

Net income and benefit cost ratio were observed to be significantly higher with the application of 120 kg N ha^{-1} (Sahoo and Panda, 1999; Pandey *et al.*, 2000 ; Sharma *et al.*, 2000).

Ameta and Dhakar (2000) recorded significant increase in net monetary returns with 150 kg N ha^{-1} over 60 kg N ha^{-1}, in maize.

Significant higher net profit was observed with the application of 180 kg N ha^{-1} compared to 60 kg N ha^{-1} (Sahoo and Mahapatra, 2004).

Kar *et al.* (2006) studied the effect of nitrogen application on the economics of sweet corn during *kharif* season in sandy loam soils of Bhubaneshwar. They observed that application of nitrogen at 80 kg ha^{-1} resulted in significantly higher net returns and benefit cost ratio.

The net returns and BCR of baby corn cultivation was highest with the application 120 kg N ha^{-1} when compared with no nitrogen, 40 and 80 kg N ha^{-1} (Bindhani *et al.*, 2007).

Suryavanshi *et al.* (2008) observed that the gross income, net income and benefit cost ratio were significantly higher with the application of 150 kg N ha^{-1} as compared to nitrogen levels of 50 and 100 kg N ha^{-1}.

MATERIALS AND METHODS

3. MATERIALS AND METHODS

The present investigation entitled "Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden" was undertaken during the summer season (March to May) of 2015. The main objectives of the study were to standardize the nutrient schedule for baby corn intercropped in coconut garden and to work out the economics. The materials used and the methodology adopted in the conduct of the experiment are presented in this chapter.

3.1 EXPERIMENTAL SITE

The experiment was conducted in the coconut garden of the Coconut Research Station (CRS), Balaramapuram. The experimental site is located at $8^0$22' 52.881" North latitude and $77^0$1' 47.303" East longitude, at an altitude of 26 m above mean sea level.

3.1.1 Soil

A composite soil sample was collected from 0-15 cm depth before the experiment and analysed for its mechanical composition and chemical properties (Tables 1 and 2). The soil chemical properties were rated as per the package of practices recommendations of the Kerala Agricultural University (KAU, 2011).

The soil of the experimental site was red sandy loam, acidic in reaction, low in available nitrogen and potassium and medium in available phosphorus.

Table 1. Mechanical composition of the soil of the experimental site

Sl. No.	Fraction	Content (%)	Method used
1.	Sand	66.43	Bouyoucous hydrometer method (Bouyoucous, 1962)
2.	Silt	18.24	
3.	Clay	15.16	

Plate 1. General view of field experiment

Table 2. Chemical properties of the soil of the experimental site

Sl. No.	Parameter	Content	Rating	Method used
1.	Soil reaction (pH)	4.60	Very strongly acidic	1:2.5 soil solution ratio using pH meter with glass electrode (Jackson, 1973)
2.	Electrical conductivity (dS m^{-1})	0.10	Normal	Conductimetry Method (Jackson, 1973)
3.	Organic carbon (%)	1.65	High	Walkley and Black rapid titration method (Jackson, 1973)
4.	Available N (kg ha^{-1})	200.70	Low	Alkaline permanganate method (Subbiah and Asija, 1956)
5.	Available P_2O_5 (kg ha^{-1})	18.56	Medium	Bray colorimetric method (Jackson, 1973)
6.	Available K_2O (kg ha^{-1})	108.70	Low	Ammonium acetate Method (Jackson, 1973)

3.1.2 Climate and Season

A warm humid tropical climate prevails over the experimental site. The field experiment was conducted during the summer season, *i.e.*, March to May, 2015. The data on standard week wise mean temperature, relative humidity (RH), rainfall and bright sunshine hours recorded during the cropping period were collected from the Agromet Observatory, CRS, Balaramapuram. The weather data during the cropping period are presented in Appendix I and graphically represented in Fig 1.

The mean maximum temperature ranged between 31.47°C and 34.21°C, mean minimum temperature between 23.08°C and 24.81°C, mean maximum RH ranged between 88.60 per cent and 94.00 per cent and the mean minimum RH ranged between 66.30 per cent and 89.10 per cent. A total rainfall of 632.2 mm was recorded during cropping period.

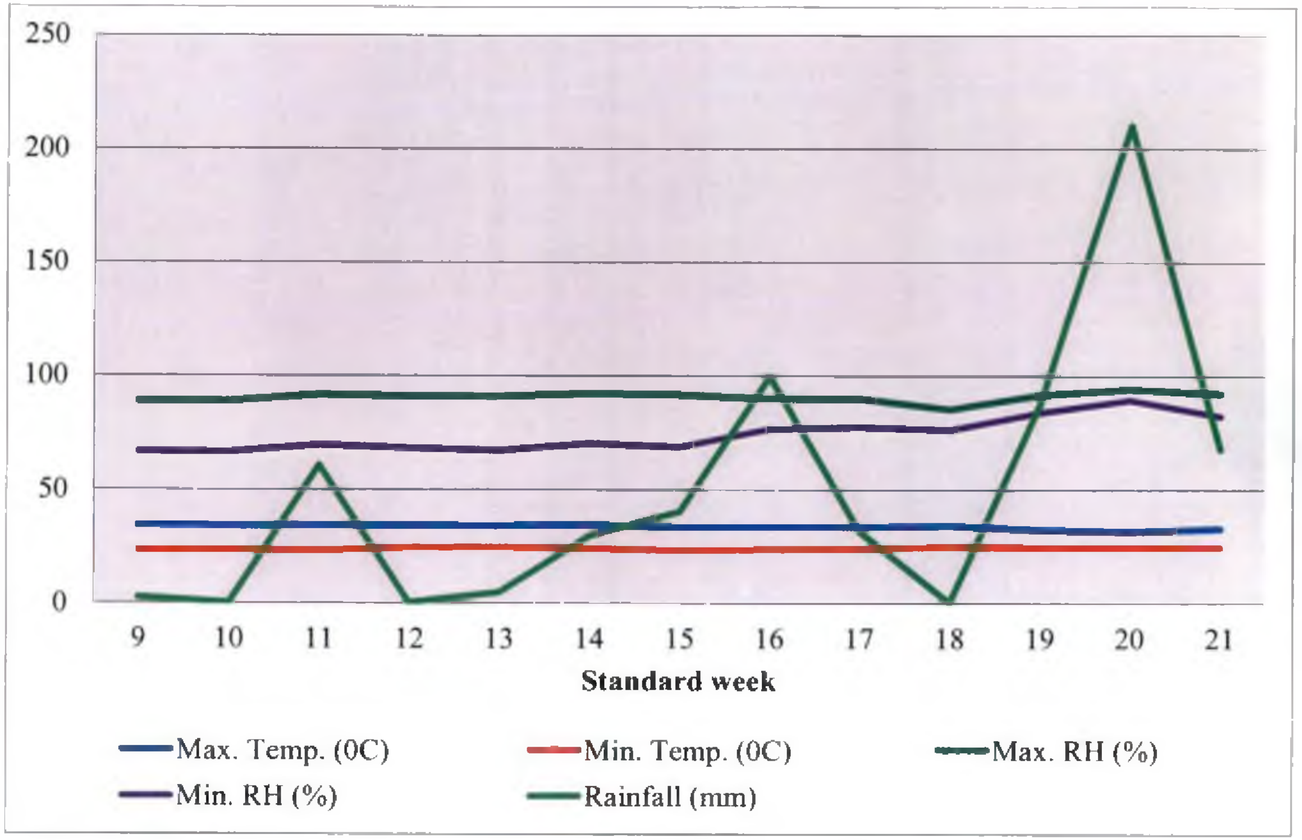


Fig.1 Mean meteorological data during cropping period (March-May, 2015)

3.1.3 Cropping History of the Experimental Site

The coconut garden selected for raising baby corn as intercrop, comprised coconut palms (West coast tall) which were more than 53 years old planted at a space of 7.6 m x 7.6 m. The inter row space of the coconut garden selected for the study was lying fallow during the previous season.

3.2 MATERIALS

3.2.1 Crop and Variety

Baby corn (*Zea mays* L.) is the young unfertilized cob of maize, 6 – 10 cm long and 1.2-1.4 cm in diameter, harvested within 1 to 3 days of silk emergence (Chauhan and Singh, 2012). The baby corn hybrid G 5414 was selected for the experiment. The important varietal characters are given in Table 3.

Table 3. Important characters of baby corn variety G 5414

Parameter	Character
Cob colour	Light yellow
Uniformity of cob	Very good
Maturity (days)	50 – 55
Releasing agency	Syngenta Seed Co. Ltd
Cost of seed (₹ kg^{-1})	450

(Chauhan and Singh, 2012)

3.2.2 Manures and Fertilizers

Well decomposed farm yard manure (0.43 per cent N, 0.18 per cent P_2O_5 , 0.38 per cent K_2O), urea (46 per cent N), rock phosphate (20 per cent P_2O_5) and muriate of potash (60 per cent K_2O) were used as nutrient sources.

3.3 METHODS

3.3.1 Design and Layout

The efficacy of three nutrient doses *viz.*, NPK recommendation of 100:40:60 kg NPK ha^{-1} (Ikisan, 2000), 150:60: 40 kg NPK ha^{-1} (TNAU, 2013) and the KAU POP for maize (KAU, 2011) modified as 135:65:45 kg NPK ha^{-1}, applied at 3 split application schedules were evaluated along with a control. The field experiment was laid out as detailed below. The layout plan of the experiment is given as Fig. 2.

Design	:	Randomised Block Design
Treatments	:	10
Replication	:	3
Spacing	:	45 cm x 20 cm
Gross plot size	:	7.2 m x 3.0 m
Net plot size	:	6.3 m x 2.6 m

3.3.1.1 Treatments

T_1 - 100 : 40 : 60 kg NPK ha^{-1} ;

½ N + ½ K as basal ; ½ N + ½ K at 25 DAS

T_2 - 100 : 40 : 60 kg NPK ha^{-1}

½ N + ½ K as basal ; ½ N + ½ K at 45 DAS

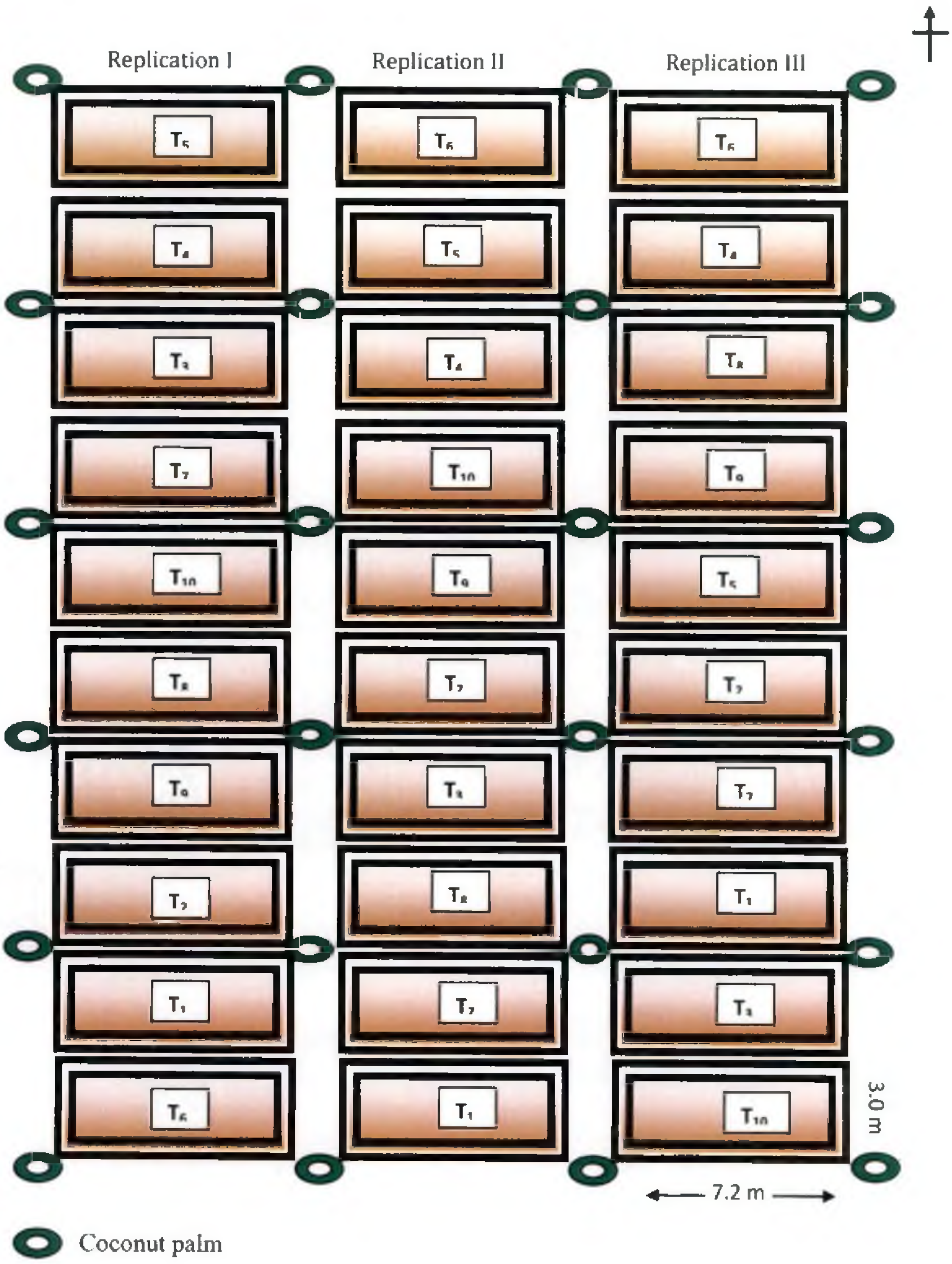


Fig. 2. Layout of field experiment

T_3 - 100 : 40 : 60 kg NPK ha^{-1}

½ N + ½ K as basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS

T_4 - 150 : 60 : 40 kg NPK ha^{-1}

½ N + ½ K as basal ; ½ N + ½ K at 25 DAS

T_5 - 150 : 60 : 40 kg NPK ha^{-1}

½ N + ½ K as basal ; ½ N + ½ K at 45 DAS

T_6 - 150 : 60 : 40 kg NPK ha^{-1}

½ N + ½ K as basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS

T_7 - 135 : 65 : 45 kg NPK ha^{-1}

½ N + ½ K as basal ; ½ N + ½ K at 25 DAS

T_8 - 135 : 65 : 45 kg NPK ha^{-1}

½ N + ½ K as basal ; ½ N + ½ K at 45 DAS

T_9 - 135 : 65 : 45 kg NPK ha^{-1}

½ N + ½ K as basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS

T_{10} - Control (no chemical fertilizers)

3.3.2 Crop Management

The crop was raised as intercrop in coconut garden during the summer season.

3.3.2.1 Land preparation

The experimental area (excluding the coconut basins) was ploughed with a tiller. Clods were crushed with the help of cultivator and the soil was brought to a fine tilth. The experimental area was levelled and the field was laid out in to experimental plots as per the layout plan. Individual plots were separated with bunds. Ridges and furrows were formed at a spacing of 45 cm between two furrows.

3.3.2.2 Sowing

The seeds of baby corn were dibbled @ 28 kg ha^{-1}, in the furrows at a spacing of 20 cm, at 3 - 4 cm depth and covered with soil.

3.3.2.3 Manures and Fertilizers

Well decomposed farmyard manure @ 12.5 t ha^{-1} was applied uniformly to all the plots (including control) at the time of land preparation. Urea, rock phosphate and MOP were applied to satisfy the nutrient requirements as per the treatments details. The split application of fertilizers was also done as basal, at 25 DAS and 45 DAS according to the treatments fixed for the study.

3.3.2.4 Gap Filling and Thinning

Gap filling and thinning were done at 10 to 12 DAS so as to maintain uniform plant population, at one plant per hill.

3.3.2.5 Weed Management

Weeding was done at 20 DAS and 40 DAS so as to maintain the plots weed free up to 50 DAS.

3.3.2.6 Irrigation

The first irrigation was given immediately after sowing. Subsequent irrigation was given at weekly intervals except at rainy periods.

3.3.2.7 Plant Protection

No pest and disease incidence was observed in the crop.

THINNING AND GAP FILLING

DETASSELING

HARVESTING COB

CUTTING STOVER

Plate 2. Major field operations in baby corn

3.3.2.8 Detasseling and Harvesting

Tassels were removed immediately on their emergence so as to prevent fertilization of the cobs. Immature cobs were harvested within two to three days of silk emergence. Six to seven harvests were carried out at two days interval. The stover was harvested after the final harvest of the cobs.

3.4 OBSERVATIONS

3.4.1 Growth and Growth Attributes

Six plants were selected randomly and tagged as sample plants in the net plot area of each plot. One row from all sides of the plot was left as border row. The following observations were recorded from the sample plants and the mean values were worked out.

3.4.1.2 Plant Height

The height of six sample plants in each plot was measured from the ground level to the collar of the upper most fully opened leaf up to the flowering stage and from ground level up to the base of tassel after flowering. The mean plant height was worked out at 15 days after emergence (DAE), 30 DAE and 45 DAE and expressed in cm.

3.4.1.3 Leaves per Plant

The number of functional leaves plant^{-1} was recorded by counting the fully opened green leaves of the six sample plants at 15 DAE, 30 DAE and 45 DAE and the mean was worked out.

3.4.1.4 Leaf Area Index

Leaf area index (LAI) was computed at 15 DAE, 30 DAE and 45 DAE, as per the formula suggested by Balakrishnan *et. al.* (1987).

$$LAI = \frac{L \times B \times n \times K}{\text{Plant spacing (cm)}}$$

L = leaf length (cm)

B = leaf breadth (cm)

n = total number of leaves per plant

K = constant (0.796)

3.4.1.5 Days to 50 per cent Tasseling

The number of days taken by 50 per cent of the plants in each net plot to reach tasseling stage was recorded.

3.4.1.6 Days to 50 per cent Silking

The number of days taken by 50 per cent of the plants in each net plot to reach silking stage was recorded.

3.4.1.7 Days to Maturity

Number of days taken by the sample plants to reach harvestable maturity was recorded.

3.4.1.8 Number of Harvests

The number of times cobs were harvested from each plot was recorded.

3.4.1.9 Dry Matter Production

The six sample plants were uprooted at the final harvest stage. They were cut very close to the ground level for the determination of dry matter production. These samples were washed and first shade dried for 4-5 days and then oven dried at 60 ± 5^0 C till constant weights were attained. The total dry matter production was expressed in kg ha^{-1}.

3.4.2 Yield Attributes and Yield

The yield attributes were recorded from the six sample plants.

3.4.2.1 Cobs per Plant

The number of cobs from the six sample plants was recorded and the mean number of cobs plant^{-1} was worked out.

3.4.2.2 Cob Length

The length of dehusked cobs from the six sample plants was measured from the base to the tip of the cob. The mean cob length was calculated and expressed in cm.

3.4.2.3 Cob Girth

The maximum girth of the cobs from the sample plants were measured and mean cob girth was calculated and expressed in cm.

3.4.2.4 Cob Weight with Husk

The total weight of unhusked cobs harvested from the six sample plants was recorded and mean cob weight was calculated and expressed as g plant^{-1}.

3.4.2.5 Cob Yield with Husk

The weight of the unhusked cobs from the net plot was recorded and expressed in kg ha^{-1}.

3.4.2.6 Marketable Cob Yield

The cobs from the sample plants were dehusked and weight of the corn was recorded and the total marketable cob yield was expressed in kg ha^{-1}.

3.4.2.7 Cob – Corn Ratio

The ratio between the weight of unhusked cob and the dehusked cob (corn) was recorded.

3.4.2.8 Green Stover Yield

After the final harvest of the cobs, the plants of each net plot was cut close to the ground, weighed and weight was expressed in t ha^{-1}.

3.4.3 Pest and Disease Incidence

No pest and disease incidence was observed in the crop.

3.4.4 Agronomic Indices

Table 4. Agronomic indices of nutrient use efficiency

(Dobermann and Fairhurst, 2000)

Agronomic index	Calculation
Agronomic efficiency	AE = (kg yield increase kg^{-1} nutrient applied) = $(Y-Y_0)/F$
Physiological efficiency	PE = (kg yield increase kg^{-1} fertilizer nutrient uptake) = $(Y-Y_0)/(U-U_0)$
Apparent recovery efficiency	ARE = (kg increase in uptake kg^{-1} applied) = $(U-U_0)/F$
Partial factor productivity	PFP = (kg yield kg^{-1} nutrient applied) = Y/F

Y – Yield from treated plot

Y_0 – Yield from control plot

U – Nutrient uptake in treated plot

U_0 – Nutrient uptake in control plot

F – Fertilizer rate

Cob with husk

Cob without husk (Corn)

Plate 3. Baby corn: cob with husk and cob without husk

3.4.5 Plant Analysis

Plant analysis was done using fresh plant samples and dried plant samples depending on the parameter to be estimated. The dried plant samples were prepared by oven drying the samples at 60 ± 5^0C for constant weights and grinding it.

3.4.5.1 Chlorophyll Content

Total chlorophyll content was estimated from fresh plant samples at 25 DAS and 45 DAS by the method given by Hiscox and Israelstam (1979). The chlorophyll content was expressed in mg g^{-1} leaf tissue on fresh weight basis.

3.4.5.2 Crude Protein Content of Cob and Stover

The crude protein content of cob and stover was worked out by multiplying the total nitrogen content of cob and stover with a factor, 6.25 (Simpson *et al.*, 1965).

3.4.5.3 Crude Fibre Content of Cob and Stover

The crude fibre content was estimated following the method suggested by Goering and Vansoest (1970).

3.4.5.4 Starch Content of Cob

Starch content was estimated in dried samples of cobs using Anthrone reagent and expressed in per cent (Sadasivam and Manickam, 1996).

3.4.5.5 Total Soluble Sugar Content of Cob

Total soluble sugar content of cob was estimated by using Hand Refractometer method and expressed as ^{0} Brix (Shobha *et al.*, 2010).

3.4.5.6 Reducing Sugar Content of Cob

Reducing sugar of cobs was estimated using Fehling solutions A and B and expressed as percentage (Sadasivam and Manickam, 1996).

3.4.5.7 Ascorbic Acid Content of Cob

Ascorbic acid of cobs was estimated by titrimetric method (Sadasivam and Manickam, 1996) and expressed as mg g^{-1} on fresh weight basis.

3.4.5.8 Uptake of N, P and K

The total nitrogen content in plant was estimated by modified microkjeldahl method (Jackson, 1973). Total phosphorus content was found out using Vanado-molybdo phosphate yellow colour method (Jackson, 1973). Total potassium content was determined using EEL Flame photometer (Jackson, 1973). The total uptake of nitrogen, phosphorus and potassium by plants at harvest was calculated as the product of the respective nutrient content and plant dry weight and expressed in kg ha^{-1}.

3.4.6 Soil Analysis

Soil samples were collected from each plot after the experiment and analyzed.

3.4.6.1 Organic Carbon

Organic carbon content was determined using the Walkley and Black rapid titration method (Jackson, 1973) and expressed in percentage.

3.4.6.2 Soil Reaction

Soil reaction (pH) was determined in 1: 2.5 soil to water suspension using pH meter with glass electrode (Jackson, 1973).

3.4.6.3 Available Nitrogen

Available nitrogen content of soil was estimated by alkaline permanganate method suggested by Subbiah and Asija (1956) and expressed in kg N ha^{-1}.

3.4.6.4 Available Phosphorus

Available phosphorus content of the soil was determined by Dickman and Bray's molybdenum blue colour method using a spectrophotometer and expressed as kg P_2O_5 ha^{-1}.

3.4.6.5 Available Potassium

Available potassium content was determined in neutral normal ammonium acetate extract, estimated in a flame photometer (Jackson, 1973) and expressed in kg K_2O ha^{-1}.

3.4.6.6 Nutrient Balance Sheet

Nutrient balance sheet of soil was worked out in terms of expected balance, apparent balance and actual balance (Senthivelu and Prabha, 2007).

Expected balance = Total nutrients added – Nutrient uptake.

Apparent balance = Soil nutrient status after the experiment – Expected balance.

Actual balance = Soil nutrient status after the experiment – Initial soil status.

Total nutrients added includes both indigenous (initial soil nutrient status) and added nutrients (organic manures and chemical fertilizers). A positive actual balance indicates soil storage and a negative actual balance indicates depletion.

3.4.7 Economic Analysis

The economic analysis of cultivation was done in terms of net income and benefit cost ratio based on cost of cultivation and prevailing price of produce.

3.4.7.1 Gross Income

Gross income was calculated by multiplying the marketable cob yield with the market price of the produce and expressed as gross income in ₹ ha^{-1}.

3.4.7.1 Net Income

The net returns were calculated by deducting the cost of cultivation from the gross returns and expressed in ₹ ha^{-1}.

Net income (₹ ha^{-1}) = Gross income (₹ ha^{-1}) – Total cost of cultivation (₹ ha^{-1}).

3.4.7.2 B: C ratio

$$\text{B: C ratio} = \frac{\text{Gross returns (₹ ha}^{-1}\text{)}}{\text{Cost of cultivation (₹ ha}^{-1}\text{)}}$$

3.4.7 Statistical Analysis

The data generated from the experiment were statistically analyzed using Analysis of Variance technique (ANOVA) as applied to Randomised Block Design (Panse and Sukhatme, 1985) and the significance was tested using F test (Snedecor and Cochran, 1967). Wherever the F values were found significant, critical difference was worked out at five per cent probability levels.

RESULTS

4. RESULTS

The present investigation entitled "Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden" was undertaken during the summer season (March to May) of 2015, in the coconut garden at the Coconut Research Station, Balaramapuram, Thiruvananthapuram. The main objectives of the study were to standardize the nutrient schedule for baby corn intercropped in coconut garden and to work out economics. The results of the study are presented in this chapter.

4.1 GROWTH AND GROWTH ATTRIBUTES

4.1.1 Plant Height

The results on the effect of nutrient schedules on the plant height of baby corn are presented in Table 5.

Plant height of baby corn was observed to vary significantly with nutrient schedules only at 30 DAE. The effect of nutrient schedules was not significant at 15 DAE and 45 DAE. The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly taller plants (125.16 cm) and was at par

50: 60: 40 kg ha^{-1} NPK ha^{-1}: ½ N + ½ K basal; ½ N + ½ K at
doses tested were observed to have positive effect on plant
with control (96.52 cm).

leaves per plant as influenced by nutrient schedules recorded
re presented in Table 6.

utrient schedules was found significant with respect to the
ant only at 45 DAE. The number of leaves per plant recorded
; NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) was

Table 5. Effect of nutrient schedule on plant height in baby corn, cm

Treatments	Plant height		
	15 DAE	30 DAE	45 DAE
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	49.20	108.85	159.06
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	50.87	108.55	170.38
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	43.96	107.83	165.80
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	45.68	122.74	165.23
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	51.47	114.14	170.40
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	47.88	108.31	166.91
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	50.30	125.16	172.30
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	45.54	112.56	166.73
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	50.78	115.91	171.26
T_{10} : Control	43.68	96.52	146.68
SE m (±)	2.84	3.54	3.75
CD (0.05)	NS	10.519	NS

DAS – days after sowing DAE – days after emergence

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

Table 6. Effect of nutrient schedule on number of leaves in baby corn, nos. $plant^{-1}$

Treatments	Number of leaves		
	15 DAE	30 DAE	45 DAE
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	5.05	7.99	11.55
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	4.99	7.78	11.55
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	4.61	7.67	11.72
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	4.94	7.61	11.66
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	5.27	8.33	11.50
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	4.94	7.66	11.77
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	5.11	7.83	11.89
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	5.17	8.28	11.28
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	5.05	8.33	11.55
T_{10} : Control	4.99	7.33	10.72
SE m (±)	0.11	0.29	0.19
CD (0.05)	NS	NS	0.555

DAS – days after sowing   DAE – days after emergence

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

significantly higher (11.89). It remained at par with all the other treatments, expect T_8 and T_{10} (control). Significant variation could not be observed in the leaf count per plant at 15 DAE and 30 DAE. Control was significantly inferior to all the other treatments with the lowest number of leaves per plant (10.72).

4.1.3 Leaf Area Index (LAI)

The results on the effect of nutrient schedules on leaf area index at 15, 30 and 45 DAE are presented in Table 7 and depicted graphically in Fig. 3.

Leaf area index was observed to vary significantly with nutrient schedules at all the three stages. Significantly higher leaf area index was recorded with the treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) at 15 DAE (0.36), 30 DAE (2.25) and 45 DAE (4.29). The control plot recorded significantly least LAI at all growth stages (0.14, 1.42 and 2.29 at 15, 30 and 45 DAE respectively).

4.1.4 Days to 50 per cent Tasseling

The results on the effect of nutrient schedules on days to 50 per cent tasseling are presented in Table 8.

The duration taken by the crop to reach 50 per cent tasseling was not affected significantly by the different nutrient schedules.

4.1.5 Days to 50 per cent Silking

The results on the effect of nutrient schedules on days to 50 per cent silking are presented in Table 8.

No significant difference was observed among the different treatments with respect to the number of days taken by the crop to reach 50 per cent silking stage.

Table 7. Effect of nutrient schedule on leaf area index in baby corn

Treatments	Leaf area index		
	15 DAE	30 DAE	45 DAE
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	0.25	1.94	3.72
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	0.21	1.68	3.38
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	0.24	1.87	3.53
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	0.30	2.02	4.06
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	0.26	1.97	3.52
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	0.27	1.99	3.67
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	0.36	2.25	4.29
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	0.34	1.96	3.91
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	0.31	2.03	4.02
T_{10} : Control	0.13	1.42	2.29
SE m (±)	0.01	0.03	0.05
CD (0.05)	0.029	0.100	0.168

DAS – days after sowing DAE – days after emergence

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

4.1.6 Days to Maturity

The results on the effect of nutrient schedules on days to maturity are presented in Table 8.

Crop duration was not observed to vary significantly with the different nutrient schedules.

4.1.7 Number of Harvests

The result on the effect of nutrient schedules on number of harvest was presented in Table 8.

There were no significant among the treatments with respect to number of harvests.

4.1.8 Dry Matter Production

The result on the effect of nutrient schedules on dry matter production is presented in Table 9 and graphically depicted in Fig. 4.

The total dry matter production varied significantly among the different nutrient schedules. Significantly higher dry matter production (24204 kg ha^{-1}) was recorded by the treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The second best treatment (19913 kg ha^{-1}) was T_4 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½,K basal; ½ N + ½ K at 25 DAS) and was at par with T_8, T_6, T_5 and T_1. Control (T_{10}) recorded significantly lower dry matter production (13192 kg ha^{-1}) as compared with the other treatments.

Table 8. Effect of nutrient schedule on days to 50 per cent tasseling, silking and days to maturity and number of harvest in baby corn

Treatments	50 per cent tasseling (days)	50 per cent silking (days)	Maturity (days)	Number of harvest
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	46.00	48.66	52.00	6.00
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	46.33	49.00	52.33	5.33
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	45.66	48.66	51.66	5.66
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	45.66	48.66	52.00	6.66
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	45.33	48.33	53.33	5.66
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	46.00	49.00	51.33	6.00
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	46.00	48.33	51.33	7.00
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	45.33	48.00	52.33	6.33
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	45.66	48.66	51.667	6.00
T_{10} : Control	46.33	48.66	51.00	5.33
SE m (±)	0.389	0.275	0.468	0.42
CD (0.05)	NS	NS	NS	NS

DAS – days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

Table 9. Effect of nutrient schedule on total dry matter in baby corn, kg ha^{-1}

Treatments	Total dry matter
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	18757
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	17631
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	17193
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	19913
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	18941
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	19216
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	24204
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	9858
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	17459
T_{10} : Control	13192
SE m (±)	436.2
CD (0.05)	1297

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

4.2 YIELD ATTRIBUTES AND YIELD

4.2.1 Cobs per Plant

The data on the number of cobs per plant as influenced by nutrient schedules are presented in Table 10.

Nutrient schedules had no significant effect on the number of cobs per plant. The crop was observed to produce on an average two cobs per plant in all the treatments including control.

4.2.2 Cob Length

The results on the effect of nutrient schedules on cob length are presented in Table 10.

Cob length varied significantly with nutrient schedules. Longest cobs (11.60 cm) were produced with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and was on par (11.33 cm) with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). Significantly lower cob length (8.50 cm) was recorded in T_{10} (control).

4.2.3 Cob Girth

The results on effect of nutrient schedules on cob girth were presented in Table 10.

Significant variation was observed in the cob girth among the different nutrient schedules. The treatment, T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher cob girth (5.30 cm), which remained on a par (5.13 cm) with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The cob girth recorded by T_{10} (control) was significantly lower (3.43 cm) when compared with the other treatments.

Table 10. Effect of nutrient schedule on number of cobs, cob length and cob girth

Treatments	Number of cobs plant^{-1}	Length of cob (cm)	Girth of cob (cm)
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	2	9.63	4.33
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	2	8.86	3.70
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	2	9.10	4.20
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	2	11.33	5.13
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	2	9.73	3.93
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	2	10.50	4.60
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	2	11.60	5.30
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	2	10.06	4.66
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	2	10.35	4.13
T_{10} : Control	2	8.50	3.43
SE m (±)	-	0.15	0.07
CD (0.05)	NS	0.448	0.283

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

4.2.4 Cob Weight with Husk

The results on the effect of nutrient schedules on cob weight with husk are presented in Table 11.

The cob weight with husk varied significantly with nutrient schedules. Significantly higher cob weight with husk (84.22 g plant^{-1}) was recorded by the treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), followed by T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) with a cob weight of 79.58 g plant^{-1}. Significantly lower weight of cob with husk (62.70 g plant^{-1}) was obtained in T_{10} (control).

4.2.5 Cob Yield with Husk

The results on effect of nutrient schedules on cob yield with husk were presented in Table 12.

The cob yield with husk was significantly influenced by the various treatments. Baby corn cob yield with husk (17162 kg ha^{-1}) was significantly higher with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and was statistically on a par (15533 kg ha^{-1}) with the T_4 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). Control (T_{10}) recorded significantly lower cob yield (8715 kg ha^{-1}) when compared with the other treatments.

4.2.6 Marketable Cob Yield

The results on effect of nutrient schedules on marketable cob yield are presented in Table 12 and graphically in Fig. 5.

The effect of nutrient schedules on marketable cob yield was observed to be significant. Significantly higher marketable cob yield (6721 kg ha^{-1}) was realised in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), which was

Table 11. Effect of nutrient schedule on cob weight with husk, g plant^{-1}

Treatments	Cob weight with husk
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	75.68
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	74.14
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	75.68
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	79.58
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	74.77
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	75.58
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	84.22
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	79.04
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	78.32
T_{10} : Control	62.70
SE m (±)	1.44
CD (0.05)	5.897

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

Table 12. Effect of nutrient schedule on cob yield with husk and marketable cob yield

Treatments	Cob yield with husk (kg ha^{-1})	Marketable cob yield (kg ha^{-1})
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	12769	4590
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	10648	3883
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	11495	4165
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	15533	6178
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	14130	5043
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	14574	5191
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	17162	6721
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	13611	4870
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	11884	4295
T_{10} : Control	8715	1497
SE m (±)	600.6	189.6
CD (0.05)	1784	563

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

statistically on par (6178 kg ha^{-1}) with T_4 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The marketable cob yield was least (1497 kg ha^{-1}) in T_{10} (control).

4.2.7 Cob-Corn Ratio

The results on the effect of nutrient schedules on cob-corn ratio are presented in Table 13.

Nutrient schedules could not exert any significant effect on the cob – corn ratio. However, the treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) exhibited a lower the cob-corn ratio (3.06). .

4.2.8 Green Stover Yield

The results on the effect of nutrient schedules on green stover yield are presented in Table 14.

Green stover yield of baby corn was significantly influenced by the nutrient schedules. Significantly higher green stover yield (26204 kg ha^{-1}) was obtained in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). It was followed by T_4 which was on a par with T_8, T_5, T_1, T_6 and T_2. Control was significantly inferior to all the other treatments recording the lowest green stover yield (15139 kg ha^{-1}).

4.3 PEST AND DISEASE INCIDENCE

There were no incidence of pest and disease during the crop growing season.

4.4 AGRONOMIC INDICES

The results on the effect of nutrient schedules on agronomic indices *viz.*, agronomic efficiency (AE), physiological efficiency (PE), apparent recovery

Table 13. Effect of nutrient schedule on cob - corn ratio in baby corn

Treatments	Cob- corn ratio
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	3.21
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	3.19
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	3.23
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	3.25
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	3.28
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	3.53
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	3.06
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	3.15
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	3.19
T_{10} : Control	3.15
SE m (±)	0.101
CD (0.05)	NS

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

Table 14. Effect of nutrient schedule on green stover yield in baby corn, kg ha^{-1}

Treatments	Green stover yield
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	22083
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	21620
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	20324
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	23014
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	22495
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	21644
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	26204
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	23194
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	20926
T_{10} : Control	15139
SE m (±)	607.2
CD (0.05)	1804

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

efficiency (ARE) and partial factor productivity (PFP) of nitrogen, phosphorus and potassium are presented in Table 15.

4.4.1 Agronomic Efficiency

Agronomic efficiency of nutrients was observed to vary significantly with nutrient schedules (Table 15). The treatment, T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher AE of 30.95 kg kg^{-1}, 58.78 kg kg^{-1} 92.86 kg kg^{-1} for N, P_2O_5 and K_2O respectively. It was followed by T_4 (23.51, 58.78 and 88.17 kg kg^{-1} respectively for N, P_2O_5 and K_2O).

4.4.2 Physiological Efficiency

Nutrient schedules had significant effect on the physiological efficiency of nitrogen, phosphorus and potassium (Table 15).

Physiological efficiency of nitrogen was significantly higher (22.90 kg kg^{-1}) in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) which was at par with T_4, T_5, T_8 and T_6. The lowest value (10.42 kg kg^{-1}) was recorded by T_2.

Significantly higher physiological efficiency (159.09 kg kg^{-1}) for phosphorus was observed in T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). It was followed by T_6 (115.60 kg kg^{-1}) which was on a par with T_7, T_5, T_1 and T_8. The treatment T_2 (100: 40: 60 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 45 DAS) recorded the lowest value (59.99 kg kg^{-1}).

Physiological efficiency of potassium was significantly higher (28.30 kg kg^{-1}) at T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), followed by T_7 (19.06 kg kg^{-1}). The treatment T_7 remained at par with T_5, T_6 and T_8. The lowest value (7.37 kg kg^{-1}) was recorded with T_3.

4.4.3 Apparent Recovery Efficiency

Significant variation was observed in the apparent recovery efficiency (ARE) of nitrogen, phosphorus and potassium in response to the different nutrient schedules (Table 15).

The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher ARE for nitrogen (1.35 kg kg^{-1}) and was on a par with T_1 (1.27 kg kg^{-1}) and T_4 (1.17 kg kg^{-1}).

ARE of phosphorus was significantly higher (0.59 kg kg^{-1}) in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). It was followed by T_1 (0.42 kg kg^{-1}) and was on a par with all the other treatments except T_9.

The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) was observed to be significantly higher (4.86 kg kg^{-1}) with respect to ARE of potassium. It was followed by T_6 (3.44 kg kg^{-1}), which remained at par with T_4, T_1, T_9 and T_5.

4.4.4 Partial Factor Productivity

Nutrient schedules had significant effect on the partial factor productivity of nitrogen, phosphorus and potassium in baby corn (Table 15).

Significantly higher PFP of nitrogen (20.70 kg kg^{-1}) was recorded with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), closely followed by T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), which recorded a PFP of 18.32 kg kg^{-1}. The lowest PFP value of 13.15 kg kg^{-1} was recorded with T_2.

However, PFP of phosphorus was significantly higher (95.35 kg kg^{-1}) in T_{10} (control). It was followed by T_7 (76.25 kg kg^{-1}) and was on a par with T_4, T_1 and T_9.

Table 15. Effect of nutrient schedules on agronomic indices

Treatments	Agronomic indices											
	AE ($kg\ kg^{-1}$)			PE ($kg\ kg^{-1}$)			ARE ($kg\ kg^{-1}$)			PFP ($kg\ kg^{-1}$)		
	N	P	K	N	P	K	N	P	K	N	P	K
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	16.21	40.53	27.02	11.95	83.68	8.68	1.27	0.42	3.11	15.54	68.19	27.00
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	7.73	19.32	12.88	10.42	59.99	8.70	0.73	0.36	1.91	13.15	57.69	21.45
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	11.12	27.80	18.53	14.73	90.23	7.37	0.77	0.30	2.56	14.11	61.89	23.61
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	23.51	58.78	88.17	20.03	159.09	28.30	1.17	0.37	3.14	18.32	73.57	37.66
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	14.43	36.09	54.14	20.02	97.04	18.55	0.72	0.36	2.93	14.96	60.06	30.83
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	15.62	39.05	58.58	18.16	115.60	17.06	0.87	0.34	3.44	15.40	61.82	32.53
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	30.95	64.28	92.86	22.90	108.87	19.06	1.35	0.59	4.86	20.70	76.25	40.20
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	14.50	30.12	43.51	19.67	78.20	16.39	0.73	0.37	2.64	15.00	55.26	29.46
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	9.38	19.50	28.16	12.77	66.17	9.39	0.74	0.29	2.99	13.23	48.73	25.04
T_{10} : Control	-	-	-	-	-	-	-	-	-	15.28	95.35	22.30
SE m (±)	2.29	5.71	4.51	2.25	12.94	1.51	0.10	0.036	0.26	0.685	3.17	1.18
CD (0.05)	6.904	17.139	13.543	6.761	38.802	4.531	0.317	0.128	0.778	2.045	9.423	3.515

DAS: Days after sowing AE: Agronomic efficiency PE: Physiological efficiency
ARE: Apparent recovery efficiency PFP: Partial factor productivity

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9

The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher PFP for potassium (40.08 kg kg^{-1}). It was at par with T_4 (37.78 kg kg^{-1}). The lowest value (21.45 kg kg^{-1}) was recorded by T_2.

4.5 PLANT ANALYSIS

4.5.1 Chlorophyll Content

The results on effect of nutrient schedules on chlorophyll content in leaf are presented in Table 16.

Chlorophyll content was significantly higher in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), both at 25 DAS (0.61 mg g^{-1}) and 45 DAS (2.20 mg g^{-1}). However, it is on par with T_6 (2.13 mg g^{-1}), T_4 (2.11 mg g^{-1}) and T_9 (1.91 mg g^{-1}) at 45 DAS. Significantly lower chlorophyll content was recorded in T_{10} (control) at 25 DAS (0.31 mg g^{-1}) and 45 DAS (1.02 mg g^{-1}).

4.5.2 Crude Protein Content in Cob and Stover

The results on effect of nutrient schedules on crude protein content in cob and stover are presented in Table 17.

Crude protein content in cob and stover differed significantly among the various treatments. Significantly higher crude protein content in cob (13.11 per cent) was recorded in T_6 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS; ¼ N + ¼ K at 45 DAS) compared to all the other treatments and it remained at par (12.71 per cent) with T_4 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS).

Among the different nutrient schedules, T_4 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher crude protein

Table 16. Effect of nutrient schedule on chlorophyll content in baby corn, mg g^{-1} leaf tissue

Treatments	Chlorophyll content	
	25 DAS	45 DAS
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	0.49	1.38
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	0.38	1.30
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	0.45	1.39
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	0.52	2.11
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	0.51	1.95
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	0.51	2.13
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	0.61	2.20
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	0.43	1.86
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	0.55	1.91
T_{10} : Control	0.31	1.02
SE m (±)	0.02	0.15
CD (0.05)	0.049	0.314

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

content in stover (7.41 per cent) and was on a par with T_7 (7.29 per cent), T_1 (7.00 per cent) and T_9 (6.59 per cent).

Control (T_{10}) proved significantly inferior with respect to crude protein content of both cob (9.70 per cent) and stover (4.14 per cent).

4.5.3 Crude Fibre Content of Cob and Stover

The results on effect of nutrient schedules on crude fibre content in cob and stover are presented in Table 17.

The crude fibre content of cob was significantly higher (8.82 per cent) was in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). However, these treatments were observed to be at par with T_6 (8.49 per cent) T_5 (8.38 per cent), T_8 (8.29 per cent) and T_9 (8.25 per cent).

The crude fibre content of stover also varied significantly with the different nutrient schedules. Crude fibre content of stover was significantly higher (37.50 per cent) in T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and was at par with T_7, T_9, T_8 and T_1. The lowest crude fibre content of stover (21.16 per cent) was recorded in T_{10} (control).

4.5.4 Starch Content of Cob

The results on effect of nutrient schedules on starch content of cob are presented in Table 18.

Starch content of cob did not differ significantly among the different nutrient schedules.

Table 17. Effect of nutrient schedule on crude protein and crude fibre content in cob and stover, per cent

Treatments	Crude protein content		Crude fibre content	
	Cob	Stover	Cob	Stover
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	11.34	7.00	7.52	31.74
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	11.00	5.60	7.30	29.00
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	10.87	5.78	7.64	30.00
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	12.71	7.41	8.82	37.50
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	11.75	5.66	8.38	30.00
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	13.11	5.95	8.49	31.00
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	11.98	7.29	8.82	34.17
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	10.70	5.42	8.29	31.82
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	11.30	6.59	8.25	32.5
T_{10} : Control	9.70	4.14	6.77	21.16
SE m (±)	0.20	0.30	0.36	2.14
CD (0.05)	0.608	0.888	1.080	6.372

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9

4.5.5 Total Soluble Sugar Content of Cob

The results on the effect of nutrient schedules on total soluble sugar content of cob are presented in Table 18.

Significant difference was observed in the total soluble sugar content with the different nutrient schedules. Total soluble sugar in cob ranged between 7.67 to 9.67° Brix. The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher total soluble sugar (9.67 °Brix). It was at par with all the other treatments except T_9 (8.33 °Brix) and T_{10} (7.67 °Brix).

4.5.6 Reducing Sugar Content of Cob

The results on the effect of nutrient schedules on reducing sugar content of cob are presented in Table 18.

Reducing sugar content of cob did not differ significantly among the various treatments. However treatment T_6 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS; ¼ N + ¼ K at 45 DAS) recorded higher reducing sugar content (3.11 per cent) compared (2.67 per cent) to T_2 (100: 40: 60 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 45 DAS).

4.5.7 Ascorbic Acid Content of Cob

Ascorbic acid content of cob did not differ significantly with the different nutrient schedules. In general, the ascorbic acid content of cob ranged from 10.93 mg g^{-1} to 15.17 mg g^{-1} (Table 18).

4.5.8 Uptake of N, P and K

The results on the effect of nutrient schedules on uptake of N, P and K are presented in Table 19 and graphically in Fig. 7. Nutrient uptake varied significantly among the nutrient schedules.

Table 18. Effect of nutrient schedule on starch, total soluble sugars, reducing sugar and ascorbic acid contents in baby corn

Treatments	Starch content (%)	Total soluble sugars (° B)	Reducing sugar (%)	Ascorbic acid (mg g^{-1})
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	9.07	8.67	2.79	13.04
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	8.05	9.00	2.67	14.10
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	8.82	8.66	2.88	13.40
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	8.58	9.33	2.79	13.75
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	8.87	9.33	2.87	10.93
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	8.54	8.66	3.11	11.28
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	8.82	9.67	2.91	14.81
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	8.04	9.00	2.81	14.10
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	8.29	8.33	2.813	14.46
T_{10} : Control	9.10	7.67	3.03	15.17
SE m (±)	0.57	0.363	0.13	1.060
CD (0.05)	NS	1.080	NS	NS

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

4.5.8.1 Uptake of Nitrogen

Total nitrogen uptake was significantly higher (304.63 kg ha^{-1}) in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS), which was on par (298.23 kg ha^{-1}) with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The lowest total nitrogen uptake (122.28 kg ha^{-1}) was observed in control (T_{10}).

4.5.8.1 Uptake of Phosphorus

Significantly higher phosphorus uptake (59.65 kg ha^{-1}) was recorded with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and it was superior to all the other treatments. It was followed by T_8 (45.98 kg ha^{-1}) which was on par with T_4, T_5, T_6 and T_9. The treatment, T_{10} (control) recorded the lowest phosphorus uptake (21.30 kg ha^{-1}).

4.5.8.1 Uptake of Potassium

Total potassium uptake of baby corn was significantly higher (277.01 kg ha^{-1}) in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and which was on par with T_1 (244.99 kg ha^{-1}). As in the case of nitrogen and phosphorus, the lowest total potassium uptake by plant (58.03 kg ha^{-1}) was observed in control (T_{10}).

4.6 SOIL ANALYSIS

4.6.1 Organic Carbon

Organic carbon content of soil did not differ significantly among the various treatments (Table 20).

4.6.2 Soil Reaction

The soil reaction (pH) was not influenced significantly by different nutrient schedules (Table 20).

Table 19. Effect of nutrient schedule on uptake of N, P and K kg ha^{-1}

Treatments	Nutrient uptake		
	N	P	K
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	249.43	38.41	244.99
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	195.87	35.92	173.07
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	200.10	33.42	212.22
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	298.23	43.55	183.67
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	230.54	43.43	175.50
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	254.19	42.11	195.66
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	304.63	59.65	277.01
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	221.64	45.98	177.00
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ¼ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	223.05	40.43	192.96
T_{10} : Control	122.28	21.30	58.03
SE m (±)	10.47	1.11	13.37
CD (0.05)	31.136	5.730	39.740

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9.

4.6.3 Available Nutrient Status of Soil after the Experiment

4.6.3.1 Available Soil Nitrogen

The results on effect of nutrient schedules on available soil nitrogen are presented in Table 20 and depicted in Fig. 8.

The nutrient schedules could not bring out any significant variation in the available nitrogen status of the soil after the experiment.

4.6.3.2 Available Soil Phosphorus

There was no significant variation in the available phosphorus status of soil among the different nutrient schedules (Table 20 and Fig. 8).

4.6.3.3 Available Soil Potassium

Nutrient schedules did not have significant effect on the available potassium status of the soil (Table 20 and graphically in Fig. 8).

4.6.4 Nutrient Balance Sheet

The balance sheet of available nitrogen, available phosphorus and available potassium as influenced by nutrient schedules are presented in Tables 21a and 21b and graphically in Fig. 9a, 9b and 9c.

The apparent balance of available nitrogen in the soil was higher than the actual balance of available nitrogen, in all the treatments including control. While the apparent balance of nitrogen was highest in T_7 (121.22 kg ha^{-1}), the treatment T_5 recorded the highest actual balance for available nitrogen (71.99 kg ha^{-1}). The actual balance of nitrogen was negative in the treatments, T_1 (-2.91 kg ha^{-1}) and T_{10} (-34.95 kg ha^{-1}).

Table 20. Effect of nutrient schedule on organic carbon, pH and soil nutrient status after the experiment

Treatments	OC (%)	pH	N (kg ha^{-1})	P_2O_5 (kg ha^{-1})	K_2O (kg ha^{-1})
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	1.29	4.27	197.81	28.77	103.02
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	1.35	4.35	230.88	29.61	108.07
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	1.32	4.46	206.14	32.08	121.58
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	1.19	4.15	218.00	30.80	100.02
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	1.19	4.23	272.69	31.66	109.00
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	1.41	4.33	226.69	36.26	115.44
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	1.20	4.39	206.04	30.60	95.55
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	1.27	4.42	242.45	31.26	104.66
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	1.16	4.53	222.66	33.24	101.22
T_{10} : Control	0.80	4.16	165.74	24.57	82.87
SE m (±)	0.14	0.09	20.77	2.08	6.81
CD (0.05)	NS	NS	NS	NS	NS

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9

Table 21a. Effect of nutrient schedules on balance sheet of N, P and K: (i) Addition and removal of nutrients, kg ha^{-1}

Treatments	Addition of nutrients									Removal of nutrient		
	Soil contribution			Manures and fertilizers			Total					
	N	P	K		P	K	N	P	K	N	P	K
T_1 : 100:40:60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	200.70	18.56	108.7	153.50	62.50	107.50	354.20	80.76	216.20	249.43	38.41	244.99
T_2 : 100:40:60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	200.70	18.56	108.7	153.50	62.50	107.50	354.20	80.76	216.20	195.87	35.92	173.07
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	200.70	18.56	108.7	153.50	62.50	107.50	354.20	80.76	216.20	200.10	33.42	212.22
T_4 : 150:60:40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	200.70	18.56	108.7	203.75	82.50	87.50	404.45	100.76	196.20	298.23	43.55	183.67
T_5 : 150:60:40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	200.70	18.56	108.7	203.75	82.50	87.50	404.45	100.76	196.20	230.54	43.43	175.50
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	200.70	18.56	108.7	203.75	82.50	87.50	404.45	100.76	196.20	254.19	42.11	195.66
T_7 : 135:65:45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	200.70	18.56	108.7	188.75	87.50	92.50	389.45	105.76	201.20	304.63	59.65	277.01
T_8 : 135:65:45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	200.70	18.56	108.7	188.75	87.5	92.50	389.45	105.76	201.20	221.64	45.98	177.00
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	200.70	18.56	108.7	188.75	87.5	92.50	389.45	105.76	201.20	223.05	40.43	192.96
T_{10} : Control	200.70	18.56	108.7	53.50	22.5	47.5	254.20	40.76	156.20	122.28	21.30	58.03

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9

Table 21b. Effect of nutrient schedule on balance sheet N, P and K: (ii) Net gain or loss in soil nutrient, kg ha^{-1}

Treatments	Expected balance			Soil status after experiment			Apparent balance			Actual balance		
	N	P	K	N	P	K	N	P	K	N	P	K
T_1 : 100:40:60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	104.76	42.34	-28.79	197.78	28.77	103.02	93.02	-13.56	131.81	-2.91	10.52	-5.68
T_2 : 100:40:60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	158.32	44.83	43.13	230.88	29.61	108.07	72.55	-15.21	64.94	30.18	11.35	-0.63
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	154.09	47.33	3.98	206.14	32.08	121.58	52.05	-15.24	117.60	5.44	13.83	12.88
T_4 : 150:60:40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	106.21	57.20	12.52	218.00	30.80	100.02	111.79	-26.65	87.49	17.30	12.54	-8.68
T_5 : 150:60:40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	173.90	57.32	20.70	272.69	31.66	109.00	98.79	-25.65	88.30	71.99	13.41	0.3
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	150.25	58.64	0.53	226.69	36.66	115.44	76.44	-22.36	114.90	25.99	18.01	6.74
T_7 : 135:65:45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	84.82	46.10	-75.81	206.04	30.60	95.55	121.22	-15.49	171.36	5.34	12.34	-13.15
T_8 : 135:65:45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	167.80	59.77	24.20	242.45	31.26	104.66	74.65	-28.50	80.46	41.75	13.01	-4.04
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	166.40	65.32	8.24	222.66	33.24	101.22	56.26	-32.07	92.98	21.96	14.98	-7.48
T_{10} : Control	131.92	19.46	98.16	165.74	24.57	82.87	33.83	5.11	-15.29	-34.95	6.31	-25.83

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9

Available phosphorus presented a negative apparent balance in all the treatments, except control. But the actual balance of available phosphorus was observed to be positive in all the treatments, including control.

All the treatments, except T_{10} (control) exhibited positive apparent balance for available potassium in soil. But the actual balance was observed to be positive only in T_3, T_5 and T_6.

4.7 ECONOMIC ANALYSIS

4.7.1 Gross Income

The results on effect of nutrient schedules on gross income are presented in Table 22.

The highest gross income of ₹ 268827, was realized with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and it remained at par with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) ₹ 247102. The treatment T_{10} (control) recorded a loss of ₹ 59878.

4.7.2 Net Income

The results on effect of nutrient schedules on net income are presented in Table 22.

The highest net income of ₹ 190367, was realized with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and it remained at par with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) ₹168617. The treatment T_{10} (control) recorded a loss of ₹ -850.

Table 22. Effect of nutrient schedule on gross income, net income and B: C ratio

Treatments	Gross income (₹ ha^{-1})	Net income (₹ ha^{-1})	B:C ratio
T_1 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	183580	106606	2.39
T_2 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	155308	78334	2.02
T_3 : 100 : 40 : 60 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	166604	88366	2.13
T_4 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	247102	168617	3.15
T_5 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	201728	123243	2.57
T_6 : 150 : 60 : 40 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	207654	126642	2.57
T_7 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 25 DAS	268827	190367	3.43
T_8 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ½ N + ½ K at 45 DAS	194814	116354	2.48
T_9 : 135 : 65 : 45 kg NPK ha^{-1} ½ N + ½ K basal ; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS	171790	91435	2.13
T_{10} : Control	59878	-850	0.98
SE m (±)	7583.67	7583.67	0.09
CD (0.05)	22533.073	22533.073	0.285

DAS - days after sowing

Note: Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied as basal in treatments T_1 to T_9

4.7.3 B: C ratio

The results on effect of nutrient schedules on the benefit cost ratio are presented in Table 22 and graphically Fig. 10.

The highest benefit cost ratio of 3.43 was observed in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) and was on a par with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) which recorded a BCR of 3.15. The lowest benefit cost ratio (0.98) was recorded in control (T_{10}).

DISCUSSION

5. DISCUSSION

The investigation entitled "Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden" was undertaken at the Coconut Research Station, Balaramapuram, Thiruvananthapuram, Kerala, during the summer season (March to May) 2015. The main objectives of the study were to standardize the nutrient schedule for baby corn intercropped in coconut garden and to work out economics. The results of the study are discussed in this chapter.

5.1 GROWTH AND GROWTH ATTRIBUTES

Application of nutrients is a key factor for ensuring better growth and productivity of crops. Adequate supply of nitrogen, phosphorus and potassium is important. The importance of sufficient nutrient supply is further increased in the case of baby corn because of its high plant density and extremely short life cycle. Fertilizers are costly inputs. Hence, it is of paramount importance that the dose of fertilizer and its time of application should be standardized, both in terms of efficiency and economics.

Plant height of baby corn was observed to vary significantly among the different nutrient schedules, at 30 DAE. The plants were significantly taller at T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS), which was on par with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS). Both leaf number and leaf area index (Fig 3) were also significantly higher at T_7. Control (T_{10}) recorded significantly lower values for all the three growth attributes. Balanced nutrition might have supported rapid cell division and elongation of cells, there by contributing to improved growth attributes in baby corn. Similar results have been observed by Sobhana *et. al.* (2012) and Kumar and Bohra (2014) in baby corn.

The duration taken by baby corn to reach 50 per cent tasseling, 50 per cent silking and harvest did not show any significant variation in response to nutrient

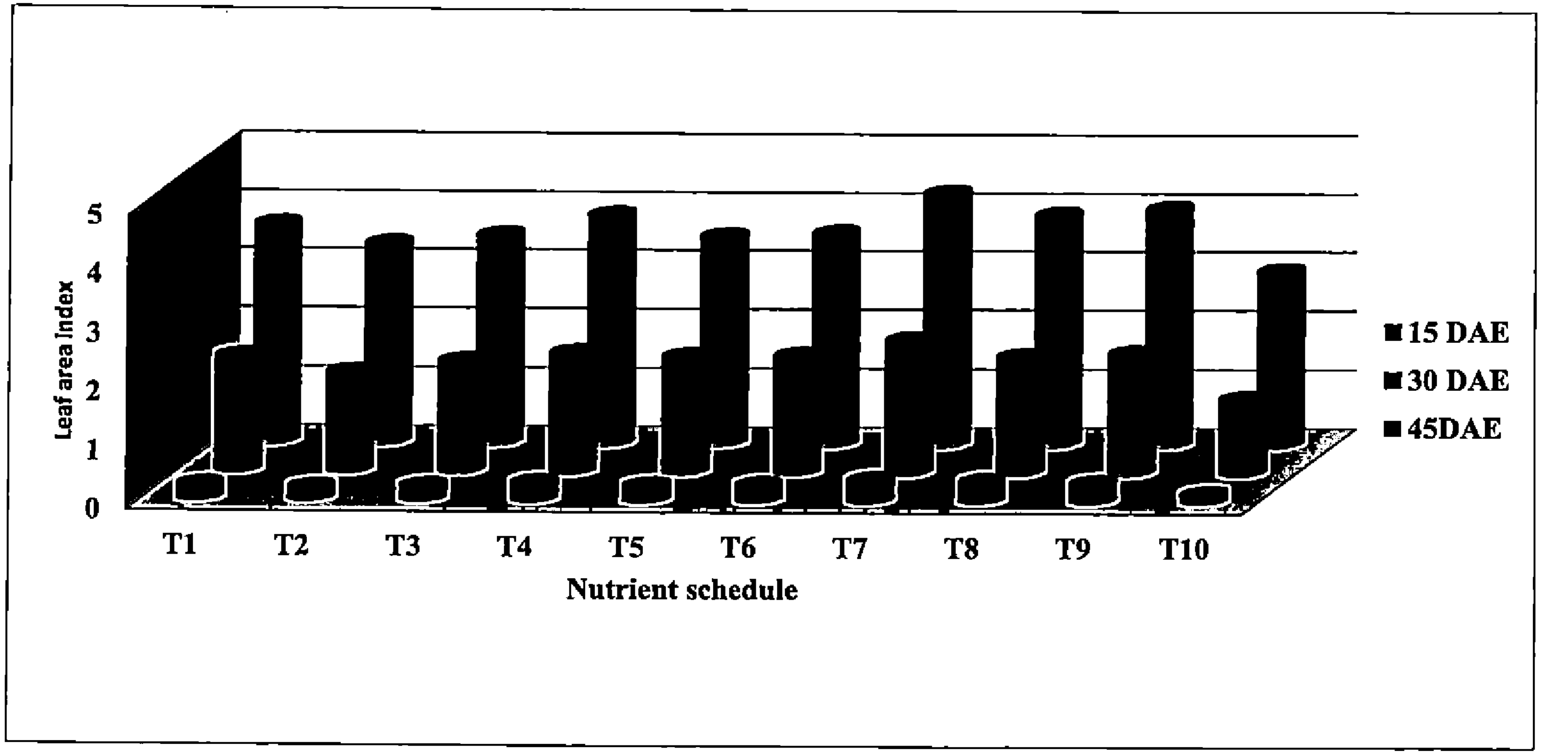
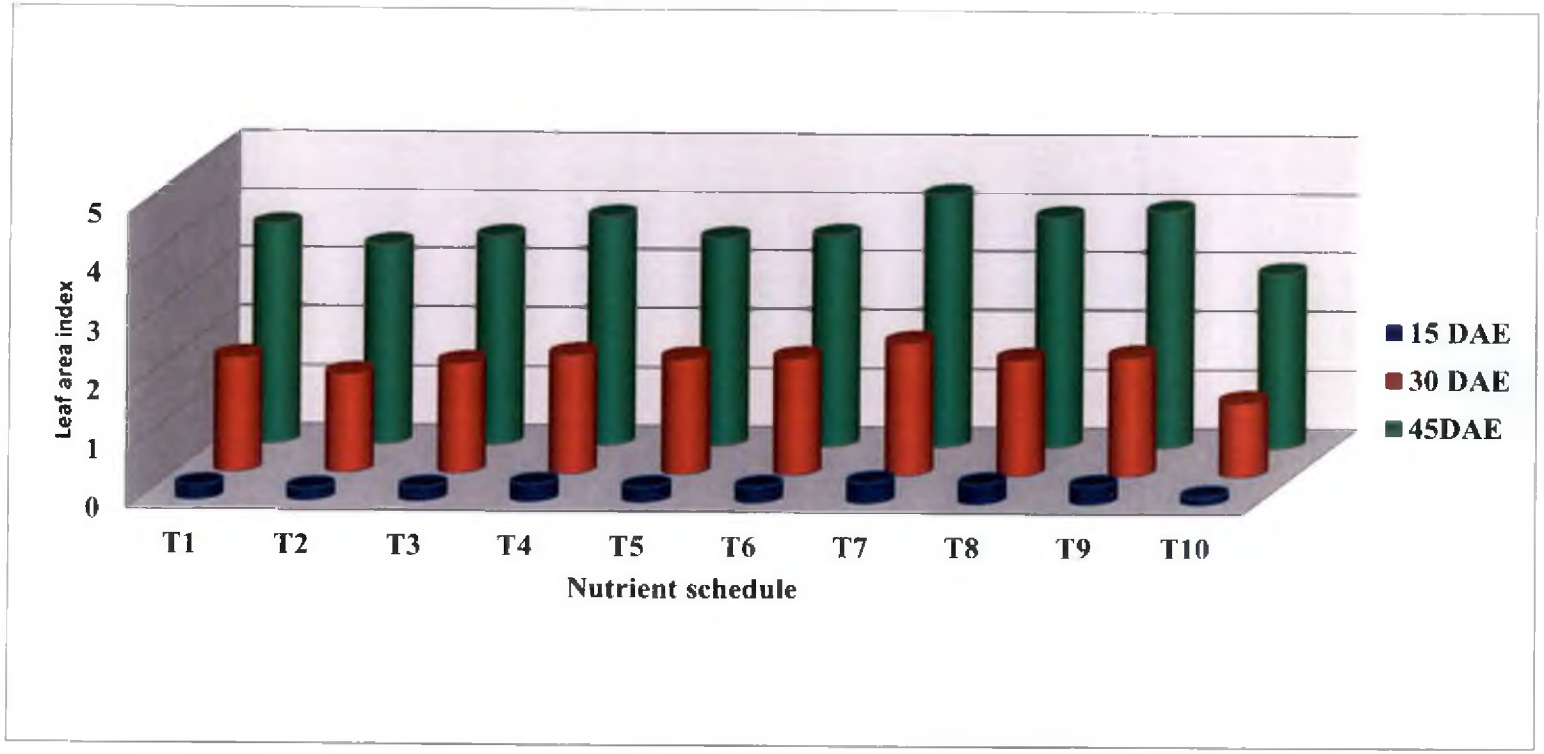


Fig. 3. Effect of nutrient schedule on leaf area index of baby corn

schedule. On an average baby corn took 46 days, 49 days and 52 days to reach 50 per cent tasseling, 50 per cent silking and harvest maturity stages, respectively. This might be indicative of the fact that these three stages are more dependent on the inherent genetic crop characters rather than nutrient schedule. The number of harvests also remained unaffected by the different nutrient schedules. Irrespective of nutrient schedules tested, on an average 5 to 7 harvests could be obtained from the crop, the highest number of harvests (7 harvests) being from the treatment T_7.

The treatment T_7 (24204 kg ha^{-1}) proved significantly superior in terms of the total dry matter produced of baby corn. Dry matter production (Fig 4) is a function of plant height, number of leaves, leaf area index and yield. All the dry matter contributing factors were observed to be significantly higher with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS). This might have favored a higher dry matter production in that treatment. The increase in dry matter production with application of nutrients, especially nitrogen has been well documented. Balanced nutrition might have also supported higher dry matter production. The growth of crops can be adversely affected by deficient or excessive supply of any one of the essential nutrients. Among the three major nutrients, nitrogen plays an important role in plant growth, since it is an integral constituent of cell component (Mohan *et al.*, 2015). Further, Muchow and Davis (1988) have reported that nitrogen fertilization to maize influenced the dry matter production by its effect on the leaf area index and photosynthetic efficiency.

Among the different split application schedules, application of ½ N + ½ K as basal followed by ½ N + ½ K at 25 DAS was observed to have beneficial effect on crop growth compared to giving one more split at 45 DAS (½ N + ½ K as basal: ¼ N + ¼ K at 25 DAS and ¼ N + ¼ K at 45 DAS). Application of nutrients in splits might have facilitated continuous and gradual supply of nutrients to the growing crop. Delay in nutrient application up to the 45th day had no influence on cob yield. In baby corn, 25 DAS corresponded to the knee high stage which is critical for the



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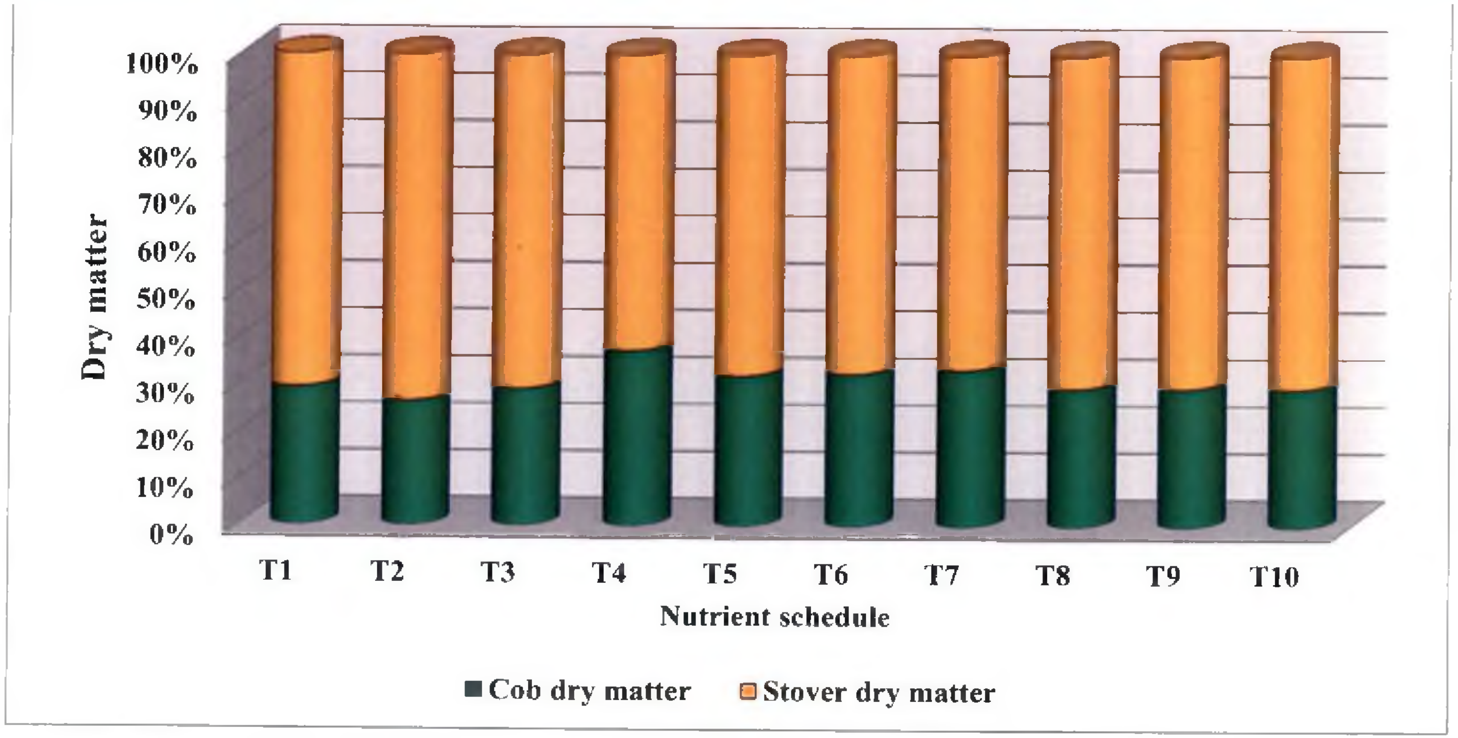


Fig. 4. Effect of nutrient schedules on dry matter partitioning between cob and stover in baby corn

crop. The uptake of nutrients by baby corn is such that the major quantity of the nutrients is absorbed by the crop is over by the tasseling stage (EIRI, 2011). The mean duration of the crop was only 52 days. Thus application of the final split at 25 DAS might have benefitted the crop more than the top dressing at 45 DAS.

5.2 YIELD ATTRIBUTES AND YIELD

Irrespective of nutrient schedules, baby corn produced two cobs plant^{-1}. However, the length and girth of the cobs were observed to vary significantly with nutrient schedules. The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal: ½ N + ½ K at 25 DAS) produced significantly larger cobs (in terms of both length and girth), higher cob yield with husk (17162 kg ha^{-1}) and marketable cob yield (6721 kg ha^{-1}) T_7 remained at par with T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K as basal; ½ N + ½ K at 25 DAS). The cob weight with husk was also significantly superior at T_7 (84.22 g plant^{-1}) followed by T_4 (79.58 g plant^{-1}). The percentage increase in cob yield with husk was to the tune of 97 per cent as compared against control (Fig. 6).

Increased level of NPK might have provided the crop with a balanced nutrient supply resulting in improved growth attributes such as plant height, leaf area index and dry matter production and consequently increased the yield attributes and yield of baby corn. Similar results have been reported by Sobhana *et al.* (2012) and Kumar and Bohra (2014). Leaf area is a key factor that influences the interception and utilization of solar radiation in crop canopies. Leaf area index decides the efficiency of canopy photosynthesis (Boote *et al.*, 1996). The significantly higher leaf area index at T_7 (Table 7.) might have resulted in better photosynthesis, thereby contributing to superior yield attributes and better yield.

Leaf chlorophyll concentration is often well correlated with plant metabolic activity (Seeman *et al.*, 1987). Further chlorophyll concentrations have been reported to reflect crop yield also (Blackmer and Schepers, 1995). Thus the higher yields

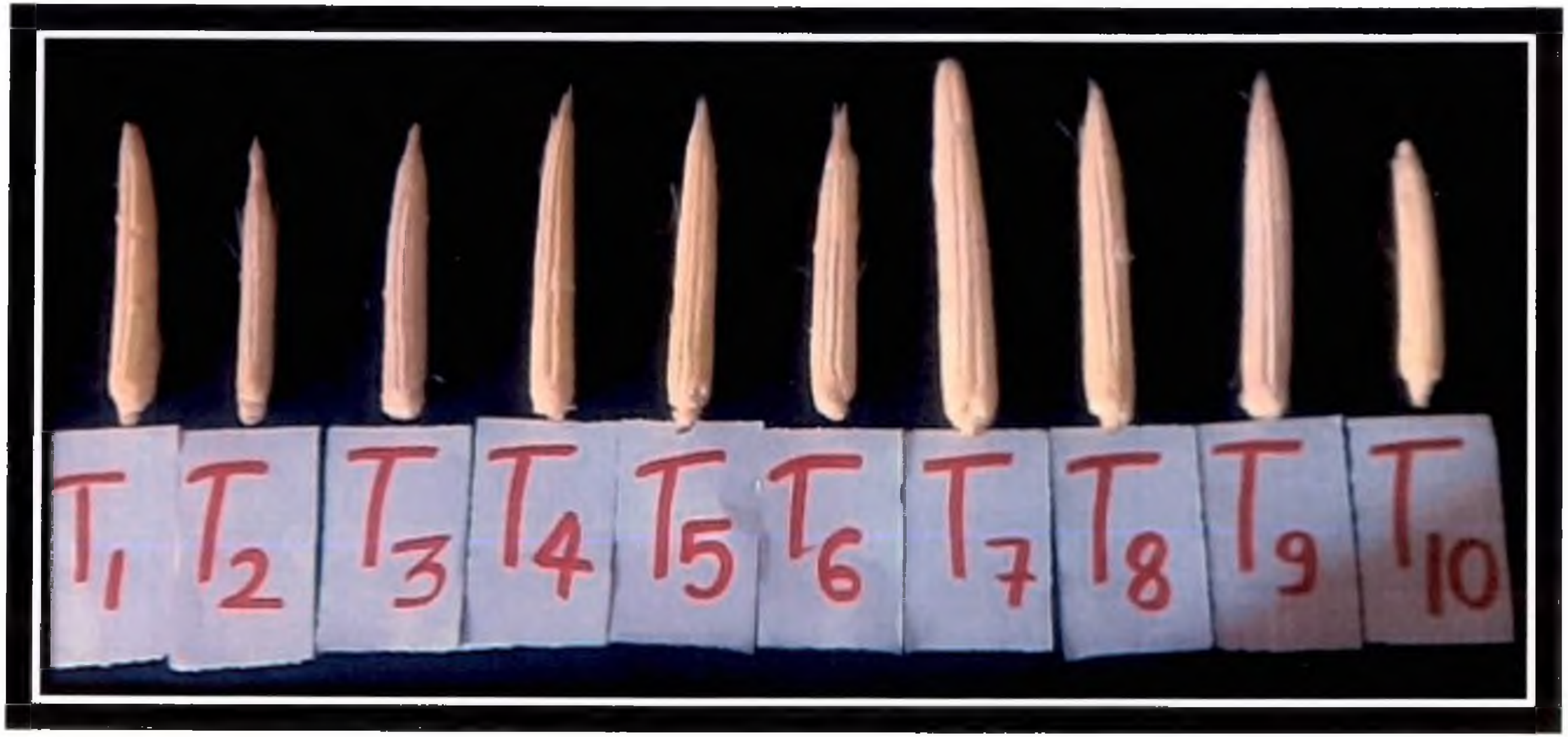


Plate 4. Effect of nutrient schedule on marketable cobs of baby corn

recorded at T_7 and T_4 could also be attributed to the higher chlorophyll contents (Table 16) supported by these treatments.

The better nutrient uptake supported by the treatment T_7 might have also contributed towards better yield in T_7. The treatment T_7 was also superior in terms of its nutrient use efficiency translated mainly as agronomic efficiency and apparent recovery efficiency.

The marketable cob yield percentage (Fig.5) was also higher for the treatments T_7 (38.16 per cent) and T_4 (39.77 per cent). The marketable cob yield was only 17.18 per cent of the cob yield with husk in the case of control. The results suggest the positive influence of nutrients in increasing the marketable cob yield. Improvement in marketable cob yield (Plate 4) could be attributed to the higher photosynthetic rates at T_7 and T_4 resulting from better light interception, light absorption and radiation use efficiency. This is in consonance with the findings of Madhavi *et al.* (1995) and Thavaprakash *et al.* (2007).

Cob - corn ratio did not vary significantly among the different treatments. A proportionate change might have occurred in the case of sheath and corn. This might be the reason for the non-significant result.

Green stover yield (26204 kg ha^{-1}) of baby corn also reflected the superiority of the treatment T_7 which was 73 per cent more than the control (Fig 6.). Green stover yield is a function of plant height (Table 5), leaf count (Table 6) and leaf area index (Table 7), which were all found to be significantly higher in T_7.

Control (T_{10}) was observed to be inferior with respect to all the growth attributes, yield attributes and yield. Apart from the profound effect of nitrogen on growth and yield, phosphorus and potassium might have also contributed towards the growth and productivity crop. Potassium has been reported to accelerate the photosynthesis and water uptake. Application of potassium increases the leaf area, dry matter accumulation and other allometric parameters. Potassium in conjunction

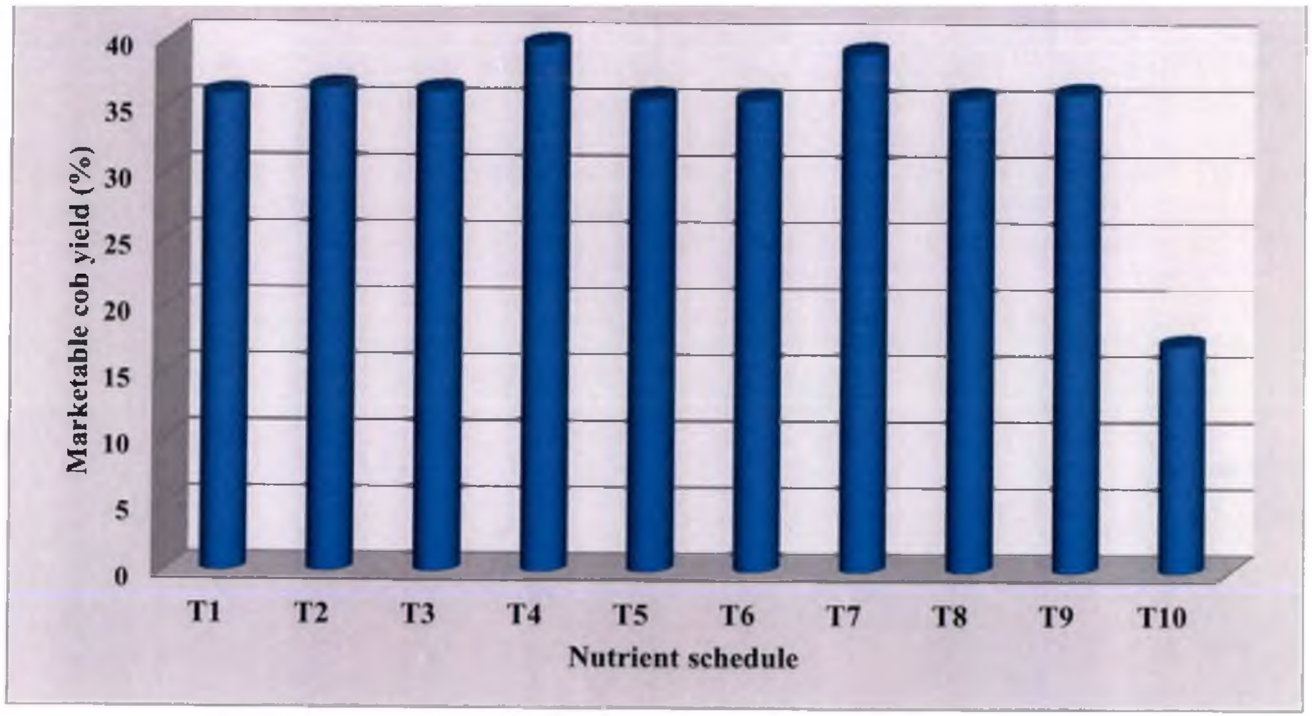


Fig. 5. Effect of nutrient schedule on marketable cob yield as percentage of cob yield with husk in baby corn

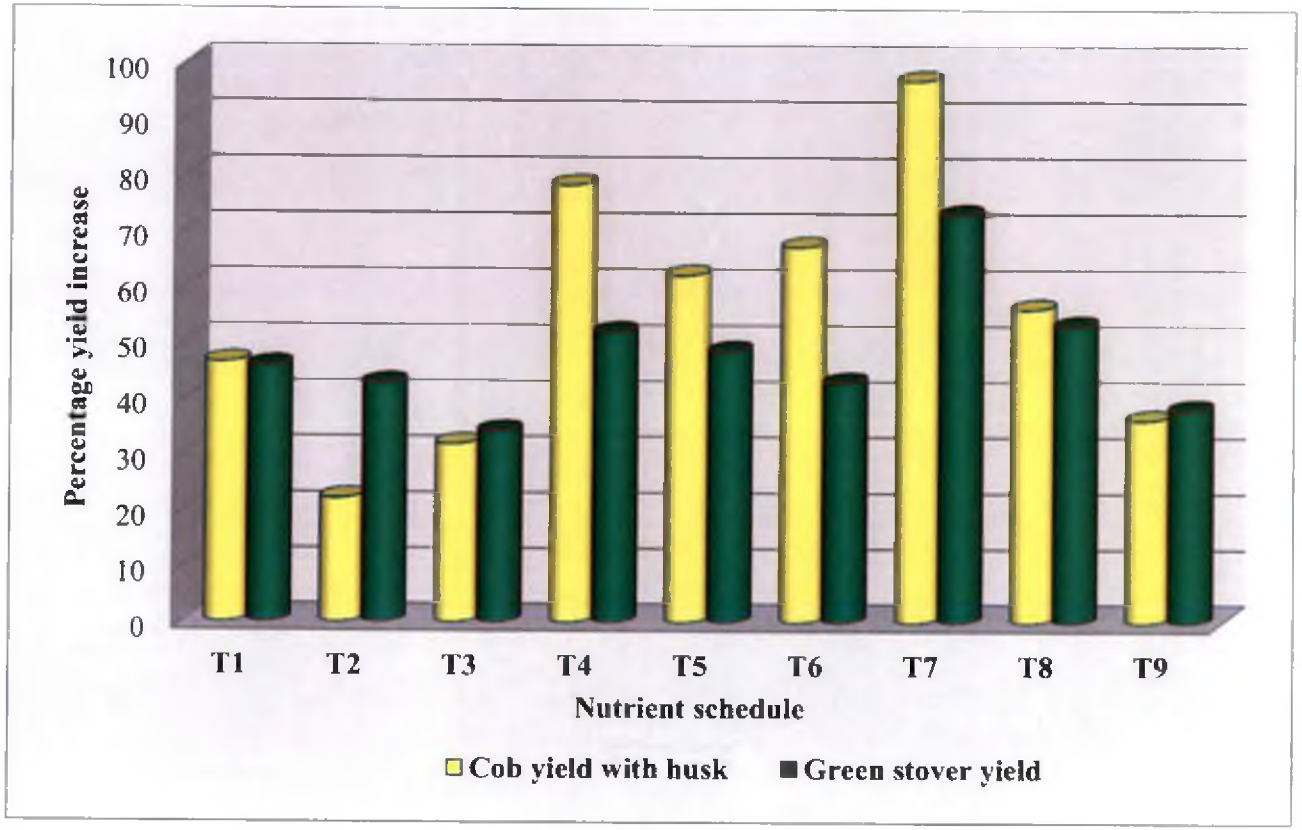


Fig. 6. Effect of nutrient schedule on percentage yield increase of baby corn over control

with N has synergistic effect in uptake, translocation and nutrient assimilation (Ahmad *et al.*, 2012).

Among the split application schedules, it was observed that application of N and K as ½ N + ½ K as basal; ½ N + ½ K at 25 DAS was more beneficial than ½ N + ½ K as basal; ½ N + ½ K at 45 DAS and ½ N + ½ K as basal; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS.

Nitrogen is the most essential element in plant growth and plays a major role in several metabolic and physiological functions (Balasubramaniyan and Palaniappan, 2001). The effect of K could be attributed to its role in activating several enzymes, increasing protein synthesis, N uptake and interaction (Asif *et al.*, 2007). Split application of nitrogen (Sangoi *et al.*, 2007) and potassium (Saleem *et al.*, 2011) have been reported to increase the yield attributes and yield of corn. Split application ensures the availability of nutrients at the critical stages of crop growth. Further split application might have reduced the loss of nutrients and thereby improved their absorption and assimilation. In the case of baby corn, 25 DAS (knee high stage) is a critical growth stage and cob initiation occurs before 45 DAS. Thus the application of nutrients at 45 DAS might have not benefitted the crop in terms of cob yield. Application of N and K at stages other than the critical growth stages might have caused the crop to be under stress and deprived it of sufficient nutrients at different growth stages. This in turn might have decreased the enzyme activation and photosynthesis, as explained by Evans and Wildes (1971) and Hermans *et al.* (2006).

5.3 AGRONOMIC INDICES

Agronomic indices reflect the nutrient use efficiency of the crops. The nutrient schedules tested had significant effect on the agronomic indices *viz.*, agronomic efficiency (AE), physiological efficiency (PE), apparent recovery efficiency (ARE) and partial factor productivity (PFP) of nitrogen, phosphorus and potassium.

Agronomic efficiency depicts the direct impact of the applied fertilizer on production. It quantifies the improvement in productivity due to the addition of nutrients. The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS) recorded significantly high AE for nitrogen (30.95 kg kg^{-1}), phosphorus (64.28 kg kg^{-1}) and potassium (92.86 kg kg^{-1}). The significantly higher cob yield recorded in T_7 might have contributed to higher AE. The average AE for cereal crops has been reported to be 10-30 kg kg^{-1} (Snyder and Bruulsema, 2007). Higher values of AE suggest that further increase in nutrient input might not bring about a positive crop response (Dobermann, 2007).

Physiological efficiency notifies the increase in yield per unit uptake of nutrients by the above ground parts of the plant (Dobermann, 2007). It shows the ability of the crop to transform the nutrients acquired from the source applied (chemical fertilizers) into economic yield. The physiological efficiency of nitrogen was significantly higher in T_7 while the efficiency for phosphorus and potassium was higher in T_4. The treatments T_7 and T_4 were at par with respect to PE of nitrogen. The percentage dry matter partitioned towards cob was higher in T_4 (Fig 4). Nutrient uptake is the product of dry matter production and nutrient content. Thus the treatment T_4 might have recorded a higher nutrient uptake by virtue of its higher dry matter. This might have in turn contributed to the higher PE.

(ARE) is one of the most complex forms of nutrient use efficiency expressions. It is defined as the difference in nutrient uptake of the plant between the fertilized and unfertilized crop in relation to the quantity of nutrient applied. Apparent recovery efficiency signifies the quantity of nutrient taken up by the crop as against the quantity applied. The effect of nutrient schedules on the apparent recovery efficiency of the three major nutrients N, P and K was analogous to that of agronomic efficiency of these nutrients. The treatment T_7 recorded significantly higher ARE for all the three major nutrients. The significantly higher dry matter production recorded at T_7 (Table 9) might have contributed to higher nutrient uptake. Further, the nutrient uptake in T_{10} (control) was observed to be the lowest. This might have contributed to higher ARE in T_7, since mathematically ARE is calculated as compared against uptake in control.

(PFP) denotes how productivity of the crop in response to the nutrients received (both applied and indigenous). Partial factor productivity of N and K was significantly higher at T_7, which was followed by T_4 and was found to be on par with T_4 . The higher PFP noted at higher nutrient doses might be indicative of the fact that the crop response to added N and K is more probably due to the low initial available N and K status of the soil. On the other hand, in the case of phosphorus, PFP was observed to decrease with increase in nutrient doses. This could be attributed to the better initial available status of phosphorus in the soil. Similar decline in PFP with increase in recommended dose of fertilizers under medium to high native soil nutrient supply has been reported by Sharma and Banik (2014).

5.4 PLANT ANALYSIS

Significantly higher chlorophyll content was recorded in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K as basal; ½ N + ½ K at 25 DAS). The chlorophyll content was significantly lower in T_{10} (control). This clearly indicated the positive influence of nutrient application on chlorophyll formation. Follet *et al.* (1981) reported that the coloration of chlorophyll depends largely on the amount of nutrients absorbed by the plant from the soil. Significant impact of nutrients on chlorophyll formation has also been reported by Amujoyegbe *et al.* (2007). Increased chlorophyll content with increasing nutrients, especially nitrogen, has been attributed to the direct involvement of nitrogen as a constituent for chlorophyll synthesis (Singh *et al.*, 2015).

Crude protein content of cob was significantly higher at T_6 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K as basal; ¼ N + ¼ K at 25 DAS and ¼ N + ¼ K at 45 DAS) and it was on par with T_4. In the case of stover, crude protein content was significantly higher in T_4 and was on par with T_7. Control (T_{10}) recorded significantly lower crude protein content, both in cob and stover. This elucidated the importance of balanced nutrition on the crude protein content. Higher nitrogen dose applied in splits was observed to increase the nitrogen uptake. The increase in crude protein content observed with nutrient application could be mainly due to the effect of nitrogen, which is an active ingredient of protein molecules and building block of amino acids as suggested by Ullah *et al.* (2015). Similar trend was observed by Gosavi and Bhagat (2009) and Aslam *et al.* (2011) in baby corn. 'Application of potassium might have also contributed to greater protein content. This might be due to enhancement in the uptake and translocation of nitrate required for amino acid synthesis. Moreover, K is also involved in synthesis of ATP required for biosynthesis of protein (Havlin *et al.*, 2013).

Further, the treatments T_4 and T_7 recorded significantly higher crude fibre content in cob, these two treatments were at par with respect to crude fibre content of stover. Crude fibre is a positive dietary factor which helps in proper digestion. The rise in crude fibre percentage with increase in nutrient levels may be attributed to the better dry matter production at T_4 and T_7. Similar results have been reported by Aslam *et al.* (2011) and Ullah *et al.* (2015).

As in the case of crude protein and crude fibre, the treatment T_7 recorded significantly higher total soluble sugar, which was at par with all the other treatments except T_9 and T_{10} (control). Total soluble sugar (TSS) was significantly lower in control. Several scientists have highlighted the importance of balanced plant nutrition in improving the quality of produce. Zekri and Obreza (2003) observed that plant growth at balanced application of N, P and K resulted in high TSS.

Starch, reducing sugar and ascorbic acid contents of cob did not show significant variation among the different nutrient schedules.

5.4.1 Nutrient Uptake

Nutrient schedules had significant effect on nutrient uptake (Fig 7). Uptake of nitrogen, phosphorus and potassium was significantly higher with T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS). The treatment T_7 recorded significantly higher plant height, leaf area index, marketable cob yield, green stover yield and consequently higher dry matter production. Nutrient uptake is the function of dry matter production and nutrient content. This is in accordance with the findings of Fageria and Baligar (2005) who have stated that nutrient accumulation pattern in plant followed the dry matter accumulation. Chemical fertilizers in optimum doses might have led to better root development as suggested by Nambiar *et al.* (1992) and Sharma and Banik (2014). This might have in turn resulted in substantially higher uptake of plant nutrients. The positive influence of applied nutrients in enhancing nutrient uptake is evident from the significantly low nutrient uptake in control (T_{10}) which was not supplemented with chemical fertilizers.

5.5 SOIL ANALYSIS

The organic carbon content and soil reaction (pH) were not affected significantly by the nutrient schedules. The soil pH was also found to decrease slightly (towards acidification) after the experiment. This possibly suggests the need for liming when baby corn is raised in acidic soils. The available nutrient status (after the experiment) *viz.*, available nitrogen, phosphorus and potassium did not show any significant (Fig 8) variation in response to the different nutrient schedules tested. However, the results showed that with the application of higher doses of nutrients there was no exhaustive effect for baby corn on the soil, in contrary to the fact that maize is a soil exhaustive crop. It was also observed that the nutrient

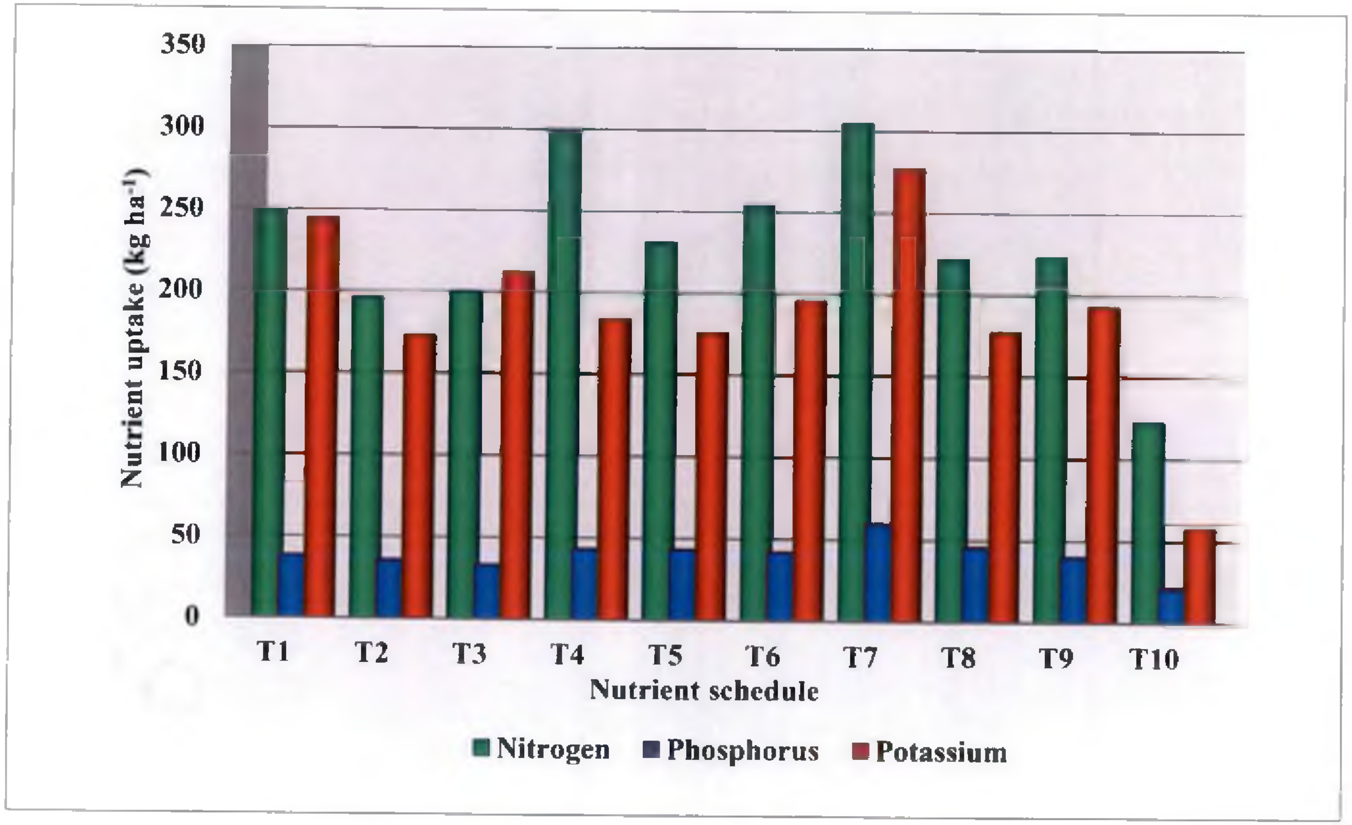
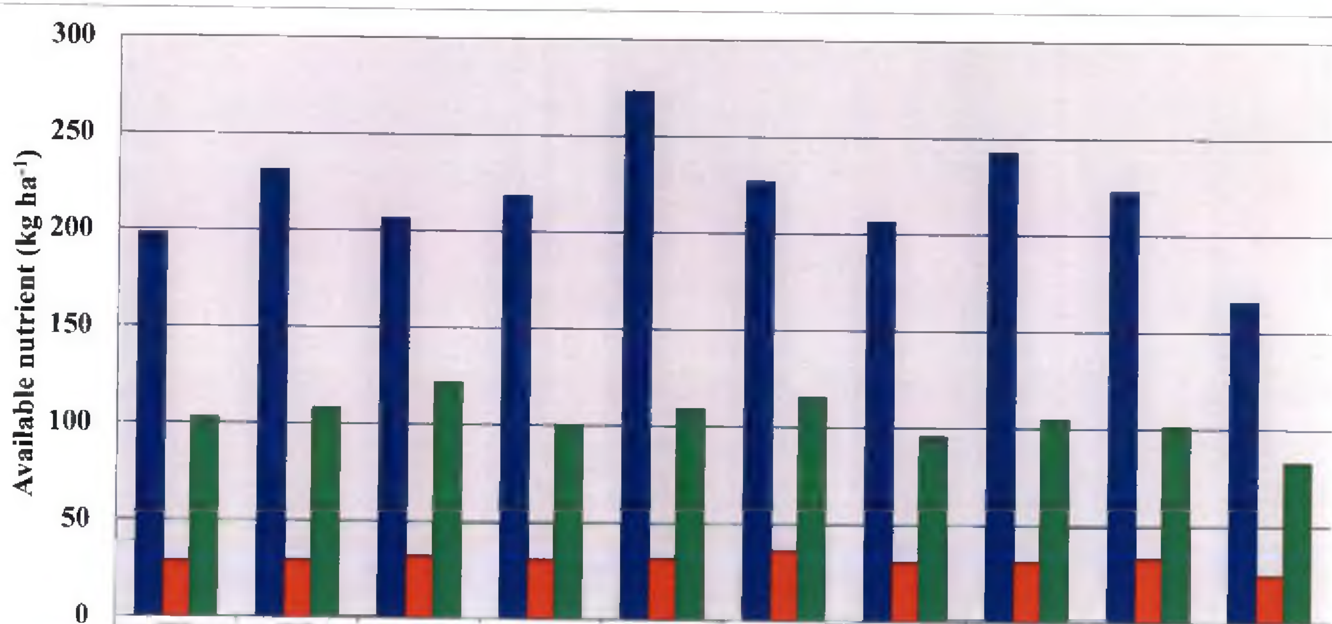


Fig. 7. Effect of nutrient schedules on plant nutrient uptake, kg ha^{-1}



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
N	197.78	230.88	206.14	218.01	272.69	226.70	206.04	242.46	222.66	165.75
P	28.78	29.61	32.09	30.80	31.67	36.27	30.60	31.27	33.25	24.57
K	103.02	108.07	121.58	100.02	109.00	115.44	95.55	104.66	101.22	82.87

Fig. 8. Effect of nutrient schedule on available soil nutrient status after the experiment

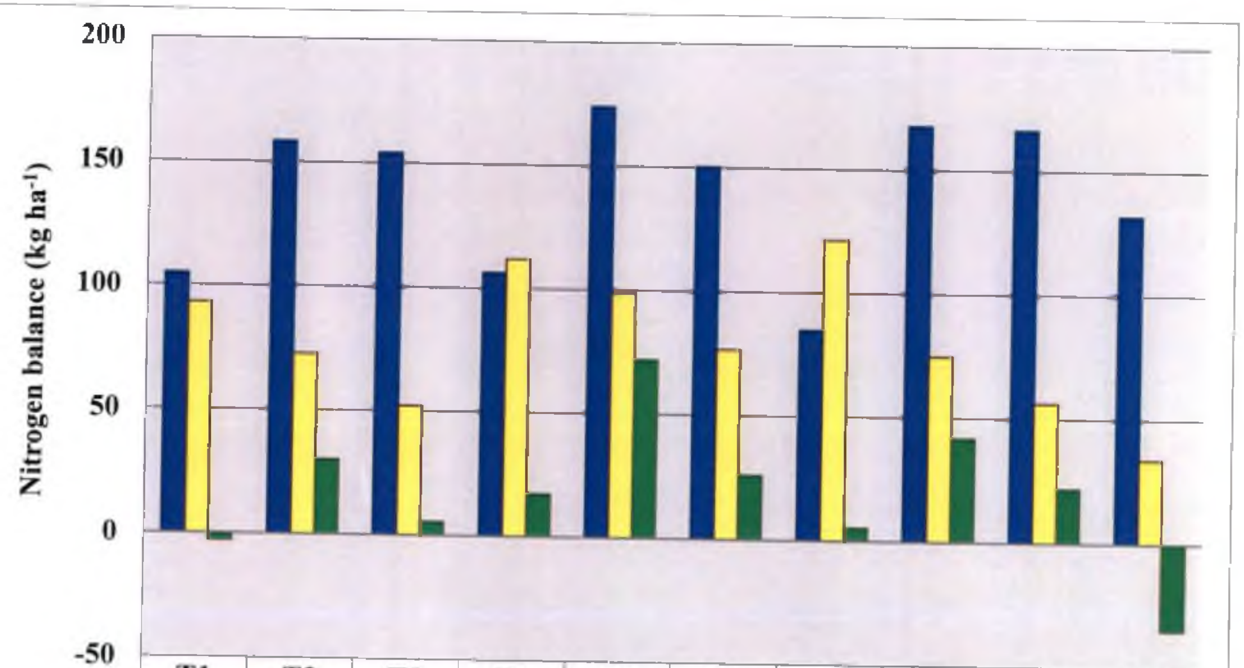
utilization by the crop was better with application of ½ N + ½ K as basal and ½ N + ½ K at 25 DAS.

5.5.1 Nutrient Balance Sheet

The apparent balance of available nitrogen (Fig 9a) was higher than the actual balance observed to be present in the soil after the experiment. Nitrogen, as such is subjected to several losses like leaching, volatilization and denitrification. The dynamic nature and susceptibility of nitrogen for various kind of losses from the soil-plant system might have resulted in a lower actual balance of nitrogen (Fig 9a) compared to its apparent balance. Control (T_{10}) recorded a net loss in available nitrogen as evidenced by an actual balance of -34.95 kg available N ha^{-1}. Baby corn, though shorter in duration when compared to grain corn, was observed to be a heavy feeder of nitrogen as evident from its nitrogen uptake values (Table 19). This indicates the need for supplementing the soil with a comparatively higher dose of nitrogen in addition to indigenous nitrogen supplying capacity of the soil.

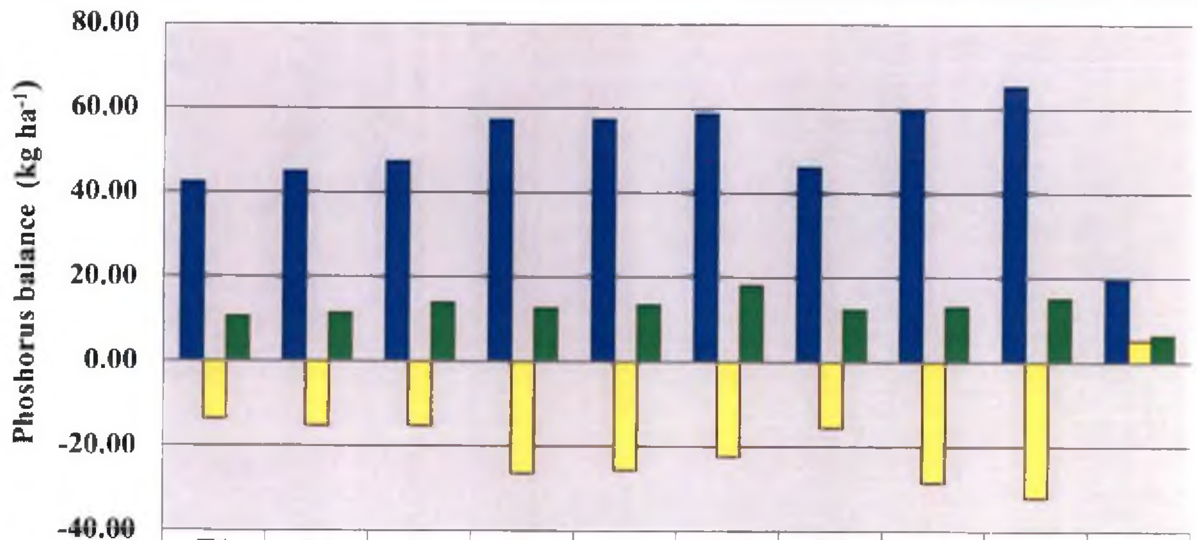
The apparent balance of phosphorus (Fig 9b) was observed to be negative in all the nutrient schedule treatments except T_{10} (control). This suggests the possibility of phosphorus getting fixed in the soil under acidic pH. However, the actual balance of phosphorus (Fig 9b) showed a positive trend indicating a build of phosphorus in the soil. Hence, the phosphorus recommendation can possibly be reduced based on the soil test recommendations since the initial available phosphorus status of the soil was medium.

The apparent balance of potassium (Fig 9c) exhibited a positive trend in all the nutrient schedules tested, except control (T_{10}). But the actual balance of potassium (Fig 9c) presented a different picture, with more or less loss in the available potassium status of the soil. The treatments, T_3, T_5 and T_6 showed a very small gain in available potassium. In general, the actual balance of potassium was observed to decline. The nutrient schedules might have ensured greater availability



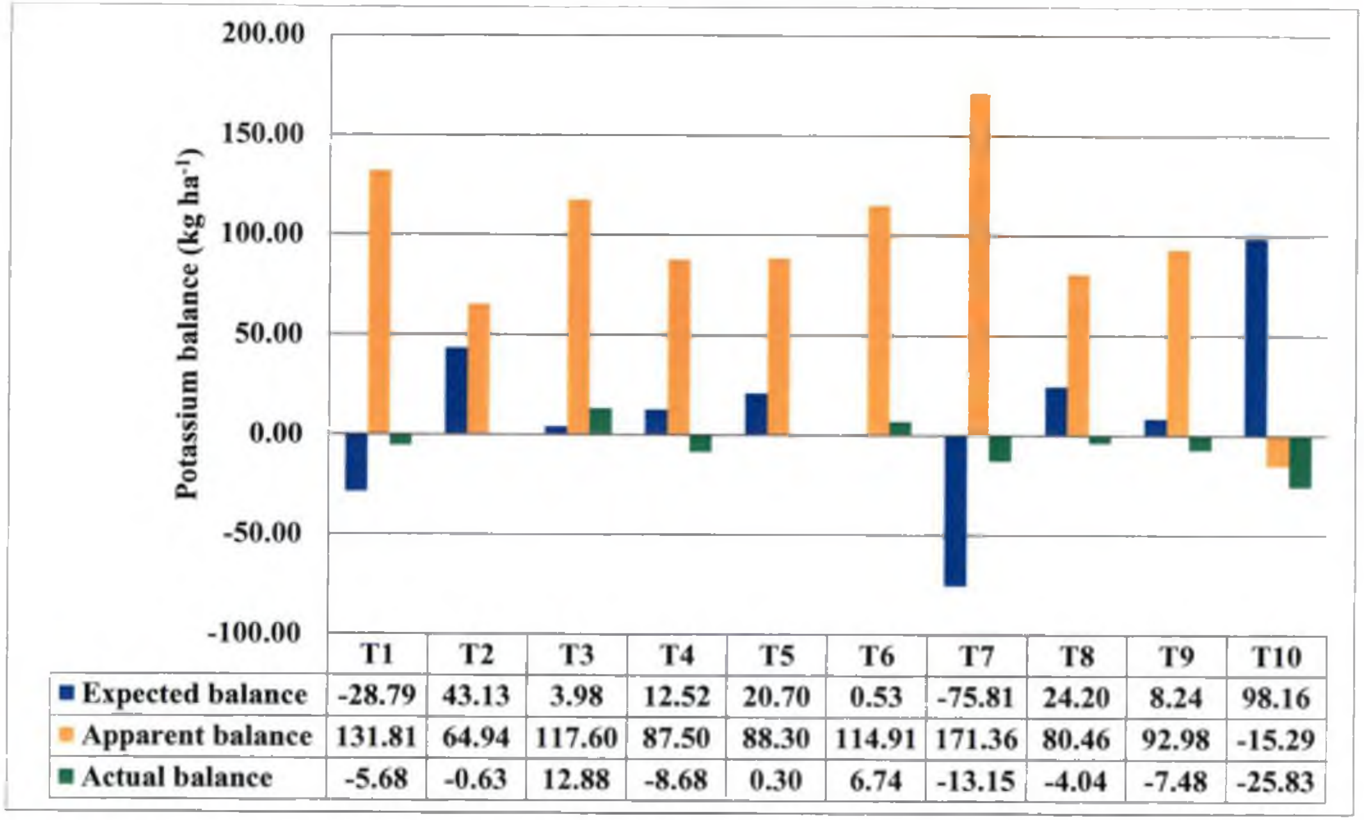
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Expected balance	104.76	158.32	154.09	106.21	173.90	150.25	84.82	167.80	166.40	131.92
Apparent balance	93.02	72.56	52.05	111.79	98.79	76.45	121.22	74.65	56.26	33.83
Actual balance	-2.92	30.18	5.44	17.31	71.99	26.00	5.34	41.76	21.96	-34.95

Fig. 9a. Effect of nutrient schedule on balance sheet of nitrogen



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Expected balance	42.34	44.83	47.33	57.20	57.32	58.64	46.10	59.77	65.32	19.46
Apparent balance	-13.56	-15.22	-15.25	-26.40	-25.65	-22.37	-15.50	-28.50	-32.08	5.11
Actual balance	10.52	11.36	13.83	12.54	13.41	18.01	12.35	13.01	14.99	6.32

Fig. 9b. Effect of nutrient schedule on balance sheet of phosphorus



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
Expected balance	-28.79	43.13	3.98	12.52	20.70	0.53	-75.81	24.20	8.24	98.16
Apparent balance	131.81	64.94	117.60	87.50	88.30	114.91	171.36	80.46	92.98	-15.29
Actual balance	-5.68	-0.63	12.88	-8.68	0.30	6.74	-13.15	-4.04	-7.48	-25.83

Fig. 9c. Effect of nutrient schedule on balance sheet of potassium

of potassium to the crop. But higher uptake of potassium, luxury consumption, nutrient loss from soil and fixation in exchangeable complexes in the soil might have led to a negative balance of potassium in the soil. Similar observations have been made by Raju and Reddy (2000). The nutrient levels tested for baby corn did not result in nutrient drain in the soil, except for potassium.

5.6 ECONOMIC ANALYSIS

Any enterprise will be readily adopted by the farmers if it is profitable. The cost of inputs and produce vary widely, both temporally and spatially. Cost of cultivation was highest in T_6 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ K as basal; ¼ N + ¼ K at 25 DAS and ¼ N + ¼ K at 45 DAS). This might be due to the higher nutrient dose clubbed together with two top dressings which escaled the labour as well fertilizer cost. Cost of cultivation was the least for control plot which was obvious.

Gross income (₹ 268827 ha^{-1}), net income (₹ 190367 ha^{-1}) and BCR (3.43) (Fig 10) were significantly high for the treatment T_7. It was on par with T_4 which recorded a gross income of ₹ 247102 ha^{-1}, net income of ₹168617 ha^{-1} and BCR of 3.15. The enhanced economic benefit in the treatments T_7 and T_4 could be attributed to the significantly high marketable cob yield. On the whole, application of fertilizers in two splits (basal + 25 DAS) was observed to be more economical in all the three nutrient doses tested. Although T_7 and T_4 were found to economically on par, the treatment T_7 was taken as the best nutrient schedule for baby corn, since the nutrient recommendation in T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS) is lower than T_4 (150: 60: 40 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS), especially with respect to nitrogen. Over use of nitrogenous fertilizers in agricultural soils is a growing environmental concern as nitrogen gets leached from the soil causing pollution (Norton *et al.*, 2015).

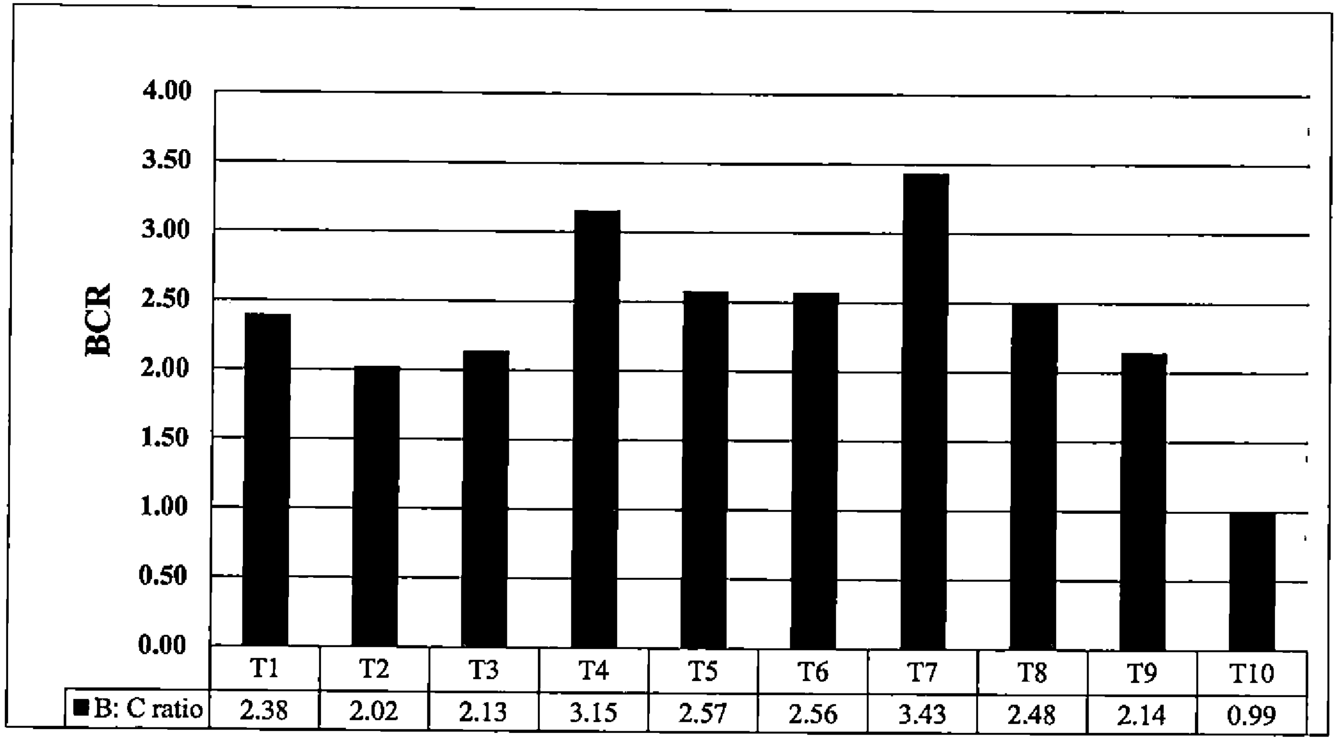
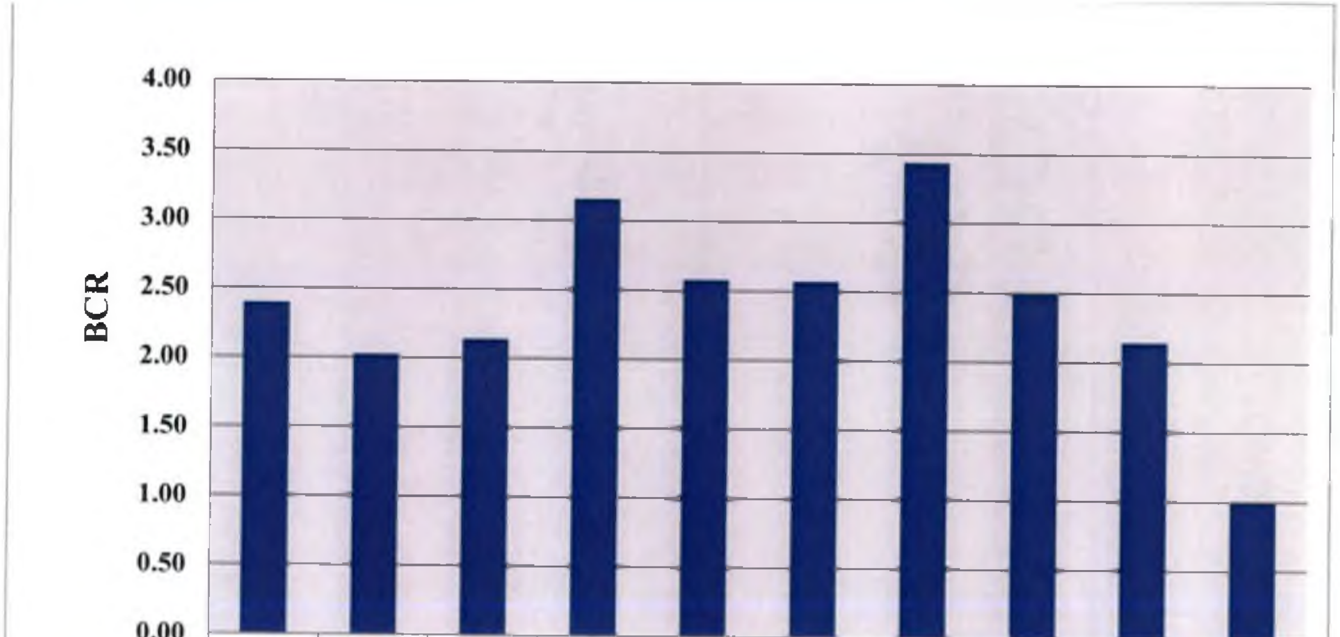


Fig. 10. Effect of nutrient schedule on B: C ratio



	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
■ B: C ratio	2.38	2.02	2.13	3.15	2.57	2.56	3.43	2.48	2.14	0.99

Fig. 10. Effect of nutrient schedule on B: C ratio

The study revealed that application of FYM @ 12.5 t ha^{-1} along with 135:65:45 kg NPK ha^{-1} (½ N + full P + ½ K as basal ; ½ N + ½ K at 25 DAS) was the best nutrient schedule for baby corn hybrid G 5414 intercropped in coconut garden, as it resulted in significantly higher marketable cob yield, nutrient use efficiency and profitability.

SUMMARY

6. SUMMARY

The experiment entitled "Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden" was undertaken at the Coconut Research Station, Balaramapuram, Thiruvananthapuram, during the summer season (March to May), 2015. The main objectives of the study were to standardize the nutrient schedule for baby corn intercropped in coconut garden and to work out the economics. The field experiment was laid out in randomised block design with 10 treatments replicated thrice. The baby corn hybrid, G 5414 was the test variety. The treatments comprised combinations of 3 nutrient doses, 3 split application schedules and a control. The treatments were T_1 : 100:40:60 kg NPK ha^{-1} (½ N + ½ K basal; ½ N + ½ K at 25 DAS); T_2 : 100:40:60 kg NPK ha^{-1} (½ N + ½ K basal; ½ N + ½ K at 45 DAS); T_3 : 100:40:60 kg NPK ha^{-1} (½ N + ½ K basal; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS); T_4 : 150:60:40 kg NPK ha^{-1} (½ N + ½ K basal; ½ N + ½ K at 25 DAS); T_5 : 150:60:40 kg NPK ha^{-1} (½ N + ½ K basal; ½ N + ½ K at 45 DAS); T_6 : 150:60:40 kg NPK ha^{-1} (½ N + ½ K basal; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS); T_7 : 135:65:45 kg NPK ha^{-1} (½ N + ½ K basal; ½ N + ½ K at 25 DAS); T_8 : 135:65:45 kg NPK ha^{-1} (½ N + ½ K basal; ½ N + ½ K at 45 DAS); T_9 : 135:65:45 kg NPK ha^{-1} (½ N + ½ K basal; ¼ N + ¼ K at 25 DAS; ¼ N + ¼ K at 45 DAS) and T_{10} : control. Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The entire dose of phosphorus was applied basally to the treatments T_1 to T_9. The salient findings of this study are summarised below.

The results indicated that nutrient doses and spilt application (nutrient schedule) had significant effect on growth, growth attributes, yield attributes and yield of baby corn. The growth attributes like plant height (125.16 cm) at 30 days after emergence (DAE), number of leaves per plant at 45 DAE (11.89), leaf area index at 15 (0.36), 30 (2.25) and 45 DAE (4.29) were significantly higher in treatment T_7 (135:65:45 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS).

Significantly higher dry matter production (24204 kg ha^{-1}) was recorded by the treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) closely followed by 19913 kg ha^{-1} with T_4 (150: 60: 40 kg ha^{-1} NPK ha^{-1}; ½ N + ½ K basal; ½ N + ½ K at 25 DAS).

The yield attributes *viz.*, cob length (11.60 cm), cob girth (5.30 cm) were significantly higher with treatment T_7 (135:65:45 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS). Significantly higher cob weight with husk (84.22 g $plant^{-1}$) was recorded by the treatment T_7 and it was followed by T_4 with a cob weight of 79.58 g $plant^{-1}$.

The treatment T_7 (135: 65: 45 kg NPK ha^{-1}; ½ N + ½ k as basal; ½ N + ½ K at 25 DAS) produced significantly larger cobs (in terms of both length and girth), higher cob yield with husk (17162 kg ha^{-1}) and marketable cob yield (6721 kg ha^{-1}). Significantly higher green stover yield of 26204 kg ha^{-1} was obtained in T_7.

Agronomic indices of nutrient use efficiency varied significantly with nutrient schedules. The treatment T_7 (135:65:45 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher agronomic efficiency of nitrogen (30.95 kg kg^{-1}), phosphorus (64.28 kg kg^{-1}) and potassium (92.86 kg kg^{-1}). Physiological efficiency (PE) of nitrogen (22.90 kg kg^{-1}) was significantly higher in T_7, while, PE of phosphorus (159.09kg kg^{-1}) and potassium (28.30 kg kg^{-1}) were significantly higher with T_4 (150: 60: 40 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The treatment T_7 recorded significantly higher apparent recovery efficiency for nitrogen, phosphorus and potassium (1.36 kg kg^{-1}, 0.59 kg kg^{-1} and 4.86 kg kg^{-1} respectively). Partial factor productivity (PFP) of nitrogen (20.70 kg kg^{-1}) and potassium (40.08 kg kg^{-1}) was significantly higher in T_7 as against significantly higher PFP of phosphorus (95.35 kg kg^{-1})in T_{10} (Control).

The chlorophyll content in leaf tissue at 25 DAS (0.61 mg g^{-1}) and 45 DAS (2.20 mg g^{-1}) and the total soluble sugar (TSS) in cob (9.67^{0} B) were also significantly higher in T_7 (135:65:45 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS).

The treatment, T_6 (150:60:40 kg NPK ha^{-1} ½ N + ½ K basal; ¼ N + ¼ K at 25 DAS and ¼ N + ¼ K at 45 DAS) recorded significantly higher crude protein content in cob (13.11 per cent). Whereas, crude protein content in stover was significantly higher (7.41 per cent) in T_4 (150:60:40 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The crude fibre content of cob was significantly superior (8.82 per cent) in T_4 and T_7. Crude fibre content of stover was significantly higher (37.50 per cent) in T_4.

The uptake of nitrogen (304.64 kg ha^{-1}), phosphorus (59.65 kg ha^{-1}) and potassium (277.01 kg ha^{-1}) by baby corn was significantly higher with the treatment T_7 (135:65:45 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS).

The actual balance of nitrogen was negative in the treatments, T_1 (-2.91 kg ha^{-1}) and T_{10} (-34.95 kg ha^{-1}). Available phosphorus presented a negative apparent balance in all the treatments, except control. But the actual balance of available phosphorus was observed to be positive in all the treatments, including control.

All the treatments, except T_{10} (control) exhibited positive apparent balance for available potassium in soil. But the actual balance of potassium was observed to be positive only in T_3, T_5 and T_6.

The treatment T_7 (135:65:45 kg NPK ha^{-1} ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher in gross income (₹ 2,68,827 ha^{-1}), net income (₹ 1,90,367 ha^{-1}) and benefit cost ratio (3.43). It was on par with T_4 which recorded a gross income of ₹ 247102 ha^{-1}, net income of ₹168617 ha^{-1} and BCR of 3.15.

Based on the present investigation entitled "Nutrient scheduling for baby corn (Zea mays L.) intercropped in coconut garden" it could be inferred that application of FYM @ 12.5 t ha^{-1} + 135: 65: 45 kg NPK ha^{-1} ; out of which 50 per cent N and K and full P as basal and remaining 50 per cent N and K as top dressing at 25 DAS, resulted in better growth attributes, yield attributes, yield, nutrient use efficiency and profitability of baby corn intercropped in coconut garden.

Future line of work

1. The performance of different varieties of baby corn in the summer rice fallows may be studied.
2. The prospects of raising baby corn as intercrop with other perennial crops may be explored.
3. The effect of integrated nutrient management on the growth, yield and quality of baby corn to be studied.

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APPENDIX

APPENDIX - I

Standard week wise meteorological data during the cropping period

(March to May, 2015)

Standard week	Mean temperature (^0C)		Total rainfall (mm)	Mean RH (%)		Bright sunshine hours
	Max.	Min.		Max.	Min.	
9 (26 Feb. – 04 Mar.)	34.13	23.31	2.3	88.7	66.6	9.2
10 (05 Mar. – 11 Mar.)	33.79	23.44	0.0	88.6	66.3	9.4
11 (12 Mar. – 18 Mar.)	33.94	23.08	60.5	91.4	69.3	9.6
12 (19 Mar. – 25 Mar.)	34.01	24.27	0.0	90.7	67.9	9.5
13 (26 Mar. – 01 Apr.)	33.81	24.41	4.6	90.7	67.0	9.5
14 (02 Apr. – 08 Apr.)	34.21	24.08	29.5	91.9	70.0	8.9
15 (09 Apr. – 15 Apr.)	33.25	23.32	40.0	91.4	68.6	9.3
16 (16 Apr. – 22 Apr.)	33.50	23.70	99.4	89.7	76.5	8.9
17 (23 Apr. – 29 Apr.)	33.45	23.88	31.5	89.6	77.3	8.4
18 (30 Apr. – 06 May)	34.01	24.81	0.0	85.1	75.9	9.9
19 (07 May – 13 May)	32.08	24.32	87.3	91.4	83.6	7.6
20 (14 May – 20 May)	31.47	24.44	210.2	94.0	89.1	6.5
21 (21 May – 27 May)	32.72	24.40	67.5	92.1	82.1	8.8

APPEDINX - II

Average input cost and market price of produce

Items	Cost (₹)
Inputs	
Seed	450 kg^{-1}
Labour wages	
Men	450 day^{-1}
Women	450 day^{-1}
Manures and fertilizers	
Farm yard manure (FYM)	1. 20 kg^{-1}
Urea	8 kg^{-1}
Rock phosphate	10 kg^{-1}
Muriate of potash (MOP)	17 kg^{-1}
Produce	
Market price of baby corn	40 kg^{-1}

NUTRIENT SCHEDULING FOR BABY CORN (*Zea mays* L.) INTERCROPPED IN COCONUT GARDEN

by

VINOD MAVARKAR

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ABSTRACT

The experiment entitled "Nutrient scheduling for baby corn (*Zea mays* L.) intercropped in coconut garden" was undertaken at the Coconut Research Station, Balaramapuram, Thiruvananthapuram, during the summer season (March to May), 2015. The main objectives of the study were to standardize the nutrient schedule for baby corn intercropped in coconut garden and to work out the economics.

The field experiment was laid out in randomised block design with 10 treatments replicated thrice, using the baby corn hybrid, G 5414 as the test variety. The treatments comprised combinations of 3 nutrient doses, 3 split application schedules and a control. The treatments were T_1 : 100:40:60 kg NPK ha^{-1} (Basal + ½ N and ½ K at 25 DAS); T_2 : 100:40:60 kg NPK ha^{-1} (Basal + ½ N and ½ K at 45 DAS); T_3 : 100:40:60 kg NPK ha^{-1} (Basal; ¼ N and ¼ K at 25 DAS; ¼ N and ¼ K at 45 DAS); T_4 : 150:60:40 kg NPK ha^{-1} (Basal; ½ N and ½ K at 25 DAS); T_5 : 150:60:40 kg NPK ha^{-1} (Basal + ½ N and ½ K at 45 DAS); T_6 : 150:60:40 kg NPK ha^{-1} (Basal + ¼ N and ¼ K at 25 DAS; ¼ N and ¼ K at 45 DAS); T_7 : 135:65:45 kg NPK ha^{-1} (Basal + ½ N and ½ K at 25 DAS); T_8 : 135:65:45 kg NPK ha^{-1} (Basal + ½ N and ½ K at 45 DAS); T_9 : 135:65:45 kg NPK ha^{-1} (Basal + ¼ N and ¼ K at 25 DAS; ¼ N and ¼ K at 45 DAS) and T_{10} : control. Farm yard manure @ 12.5 t ha^{-1} was applied uniformly to all the treatments, including control. The ½ N + ½ K were given as basal and entire dose of phosphorus was applied basally to the treatments T_1 to T_9.

The results indicated that nutrient doses and spilt application (nutrient schedule) had significant effect on growth, growth attributes, yield attributes and yield of baby corn. The treatment T_7 (135:65:45 kg NPK ha^{-1} ; ½ N + ½ K basal; ½ N + ½ K at 25 DAS) recorded significantly higher Plant height (125.16 cm) at 30 days after emergence (DAE), number of leaves per plant at 45 DAE (11.89), leaf area index at 15 (0.36), 30 (2.25) and 45 DAE (4.28) and dry matter production (24203.70 kg ha^{-1}). Significant difference was not observed in the number of days taken by the

crop to reach 50 per cent tasseling, 50 per cent silking, maturity and in the number of harvests. The yield attributes *viz.*, cob length (11.60 cm), cob girth (5.30 cm) and cob weight with husk (84.22 g $plant^{-1}$) recorded significantly higher values at T_7. Similar results were recorded in cob yield with husk (17162 kg ha^{-1}), marketable cob yield (6721 kg ha^{-1}) and green stover yield (26204 kg ha^{-1}). All the above yield attributes (except cob weight with husk) were on a par with T_4 (150:60:40 kg NPK ha^{-1} ; ½ N + ½ K basal; ½ N + ½ K at 25 DAS). The number of cobs per plant and the cob – corn ratio remained unaffected by the treatments.

Agronomic efficiency (AE) which is a reflection of all the other agronomic indices, showed significant variation with nutrient schedule. AE of nitrogen (30.95 kg kg^{-1}), phosphorus (64.28 kg kg^{-1}) and potassium (92.86 kg kg^{-1}) were significantly higher at T_7. AE of phosphorus and potassium remained at par with T_4. The chlorophyll content in leaf tissue at 25 DAS (0.61 mg g^{-1}) and 45 DAS (2.20 mg g^{-1}) and the total soluble sugar (TSS) in cob (9.67°B) were also significantly higher in T_7. The treatment, T_6 recorded significantly higher crude protein content in cob (13.11 per cent) and was on a par with T_4. The crude fibre content of cob was significantly superior (8.82 per cent) in T_4 and T_7. Nutrient uptake (N, P, K) was significantly superior in T_7.

The superior treatments, T_7 and T_4 recorded positive balance for N (5.34 kg ha^{-1}; 17.30 kg ha^{-1}) and P (12.34 kg ha^{-1}; 12.54 kg ha^{-1}) and a negative balance for K (-13.15 kg ha^{-1}; -8.68 kg ha^{-1}).

Gross income (₹ 2,68,827 ha^{-1}), net income (₹ 1,90,367 ha^{-1}) and benefit cost ratio (3.43) were significantly higher in T_7.

The study revealed that application of FYM @ 12.5 t ha^{-1} + 135:65:45 kg NPK ha^{-1} (½ N + full P + ½ K as basal ; ½ N + ½ K at 25 DAS) resulted in significantly higher marketable cob yield, nutrient use efficiency and profitability in baby corn variety G 5414, intercropped in coconut garden.

സംഗ്രഹം

മക്ക ചോളത്തിന്റെ കോബുകൾ പരാഗണം തടഞ്ഞ് ഇളം പരുവത്തിൽ വിളവെടുക്കുന്നതിനെയാണ് ബേബികോൺ എന്ന് പറയുന്നത്. തെങ്ങിൻ തോപ്പിൽ ഇടവിളയായി കൃഷിചെയ്യുന്ന ബേബി കോണിനു വേണ്ട പ്രധാന മൂലകങ്ങളെക്കുറിച്ചും, അവ നൽകേണ്ട സമയത്തെക്കുറിച്ചുമുള്ള ഒരു പരീക്ഷണം 2015 മാർച്ച് മുതൽ മെയ് വരെയുള്ള കാലയളവിൽ ബാലരാമപുരം തെങ്ങ് ഗവേഷണ കേന്ദ്രത്തിലെ, ഏകദേശം 53 വർഷം പ്രായമുള്ള തെങ്ങിൻ തോപ്പിൽ നടത്തുകയുണ്ടായി. പോഷക മൂലകങ്ങളിലൂടെ ബേബികോണിന്റെ വളർച്ച, സാമ്പത്തിക ലാഭം എന്നിവയിലുണ്ടാകുന്ന മാറ്റങ്ങളെക്കുറിച്ച് പഠിക്കുക എന്നതായിരുന്നു പ്രധാനലക്ഷ്യം.

പ്രസ്തുത പരീക്ഷണത്തിന് റാൻഡമൈസ്ഡ് ബ്ലോക്ക് ഡിസൈൻ എന്ന പഠന രീതിയാണ് അവലംബിച്ചത്. ജി 5414 എന്ന ഹൈബ്രിഡ് ബേബികോൺ ഇനമാണ് പഠനവിധേയമാക്കിയത്. പത്ത് പരിചരണമുറകളാണ് പരീക്ഷിക്കപ്പെട്ടത് - T_1:100:40:60 കി.ഗ്രാം NPK/ഹെ. (½ N+½ K അടിവളം; ½ N+½ K വിത്തിട്ട് 25-ാം ദിവസം); T_2:100:40:60 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ½ N+½ K വിത്തിട്ട്; 45- ാം ദിവസം); T_3:100:40:60 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ¼ N + ¼ K വിത്തിട്ട് 25-ാം ദിവസം; ¼ N+ ¼ K വിത്തിട്ട് 45-ാം ദിവസം); T_4:150:60:40 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ½ N+½ K വിത്തിട്ട് 25-ാം ദിവസം); T_5:150:60:40 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ½N+½K വിത്തിട്ട് 45-ാം ദിവസം); T_6:150:60:40 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ¼ N+ ¼ K വിത്തിട്ട് 25-ാം ദിവസം; ¼ N+ ¼ K വിത്തിട്ട് 45-ാം ദിവസം); T_7:135:65:45 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ½ N+½ K വിത്തിട്ട് 25-ാം ദിവസം); T_8:135:65:45 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ½ N+½ K വിത്തിട്ട് 45-ാം ദിവസം); T_9:135:65:45 കി.ഗ്രാം NPK/ഹെ (½ N+½ K അടിവളം; ¼ N+ ¼ K വിത്തിട്ട് 25-ാം ദിവസം; ¼ N+ ¼ K വിത്തിട്ട് 45-ാം ദിവസം); T_{10}: രാസവളങ്ങൾ ഒന്നുമില്ല. മേൽപ്പറഞ്ഞ എല്ലാ പരിചരണ മുറകൾക്കും ഹെക്ടർ ഒന്നിന് 12.5

ടൺ എന്ന തോതിൽ കാലിവളം നൽകിയിരുന്നു. T_1 മുതൽ T_9 വരെയുള്ള പരിചരണ മുറകളിൽ മുഴുവൻ ഫോസ്ഫറസ് വളവും അടിവളമായി നൽകി.

ബേബി കോൺ ചെടിയുടെ ഉയരം, ഇലകളുടെ എണ്ണം, വിസ്തീർണ്ണം തുടങ്ങിയവ T_7 ൽ കൂടുതലായിരുന്നു. ബേബി കോണിൽ വിളവിന്റെ മാനദണ്ഡങ്ങളായ കോബിന്റെ നീളം, ചുറ്റളവ്, ഓലയോടുകൂടിയ ഭാരം, ഓലമാറ്റിയതിന് ശേഷമുള്ള ഭാരം എന്നിവയൊക്കെ T_7ലായിരുന്നു കൂടുതൽ. പോഷകമൂലക ഉപയോഗ കാര്യക്ഷമതയും T_7 ൽ കൂടുതലായിരുന്നു. പ്രസ്തുത പരിചരണ മുറ ബേബികോണിന്റെ അറ്റാദായവും വർദ്ധിപ്പിച്ചു.

തെങ്ങിൻ തോപ്പിൽ ഇടവിളയായി കൃഷി ചെയ്യുന്ന ബേബികോണിന് ഹെക്ടർ ഒന്നിന് 12.5 ടൺ കാലിവളവും, 135:65:45 കി.ഗ്രാം NPK/ഹെ (½ N+ മുഴുവൻ P+½ K അടിവളം; ½ N+½ K വിത്തിട്ട് 25-ാം ദിവസം) എന്ന നിരക്കിൽ രാസവളവും നൽകുന്നത് കൂടുതൽ വിളവും, പോഷകമൂലക ഉപയോഗ കാര്യക്ഷമതയു, ലാഭവും നൽകുന്നതായി രേഖപ്പെടുത്തി.