QUALITY AND STORAGE LIFE OF ORIENTAL PICKLING MELON [*Cucumis melo* var. *conomon* (L) Makino] AS INFLUENCED BY MAJOR NUTRIENTS

By
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DECLARATION

I hereby declare that this thesis entitled "Quality and storage life of oriental pickling melon (*Cucumis melo* var. *conomon* (L.) Makino) as influenced by major nutrients" 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.

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CERTIFICATE

Certified that this thesis, entitled "Quality and storage life of oriental pickling melon (*Cucumis melo* var. *conomon* (L.) Makino) as influenced by major nutrients" is a record of research work done independently by Miss. LISSAMMA JOSEPH under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship, or associateship to her.

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INTRODUCTION

INTRODUCTION

Crop nutrition is one of the factors influencing the quality and storage behaviour of fruits and vegetables. Contribution of fertilisers to enhanced productivity is an established fact. However, poor quality of vegetables grown under high fertiliser regimes had been reported off late. Negative influence of nutrition on the storage life of produce has become a matter of serious concern to cultivators and consumers as well. There is a school of thought that manures and fertilisers influence the produce quality and keeping quality of vegetables as strongly as the yield components.

Studies carried out to compare and contrast the influence of organic and inorganic nutrients on the quality and post-harvest storage life of fruits and vegetables have failed to arrive at definite conclusions. However, there is a popular belief among the farmers that growth, wholesomeness, taste and nutritive value of vegetables are better if grown with organic manures than when grown with inorganic fertilisers. Thus it appears that the effect of organic manures and inorganic fertilisers on yield and quality of vegetables should be assessed individually and in combination. Moreover, optimum doses of organic manures and/or inorganic fertilisers giving

enhanced production of vegetables without hindrance to quality also should be looked into. So far, no systematic studies had been undertaken in these lines.

During the present investigation the influence of organic manures and inorganic fertilisers on yield, quality and storage behaviour of oriental pickling melon (Cucumis melo var conomon (L) Makino; Family Cucurbitaceae) a popular vegetable crop of Kerala, was studied.

The objectives of the study were to assess

i. the effects of organic and inorganic manures on the quality of oriental pickling melon,

ii. possibility of improving the storage life of oriental pickling melon by the application of organic manures, and

iii. the comparative yield response of oriental pickling melon to the organic and inorganic manures.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The effect of nutrition on the quality and storage life of crops has been recognised for quite sometime. But most of the studies conducted in this aspect is concentrated on fruits. Literature on the effect of organic and inorganic manures on the quality and post harvest life of vegetables is limited and is almost none in the case of oriental pickling melon (Cucurbitaceous plant). The available literature on vegetables and some other crops in this aspect are reviewed and presented under the following titles.

A. Influence of organic and inorganic manures on the quality and yield of crops

The value of consumable food is governed to a great extent by the nature and amount of protein, minerals and vitamins present in it. The food value can be altered to a certain degree by manipulation of plant nutrients applied to the soil in which the plant is grown. Many workers measured the quality aspect of vegetables as influenced by manures by determining one or more of the constituents such as acid content, total solids, reducing sugars, vitamin C content and ash constituents.

1. Protein and ash constituents

It has been reported that fertiliser treatments have

definite effect on the composition of vegetables.

Lenhan (1926) reported an increased potassium content in tomato fruits from plants grown with chemical fertilisers. Stanberg and Clare (1950) observed higher nitrogen and phosphorus levels in brig cherries with increased nitrogenous and phosphatic fertiliser application. Increase in potassium content in hay by application of phosphatic and potash fertilisers was also reported by Franke (1954). Lamb (1961) stated that application of phosphatic fertilisers in acid soil markedly increased phosphorus content in tomato leaves. Thomas (1966) found that content of Ca, Mg and K in leaf tissue of squashes were dependant on the amount of nitrogen and phosphorus applied. Thomas and McLean (1967) concluded that in squashes increased application of nitrogen raised the nitrogen content and reduced the phosphorus and potassium contents in the plant tissue. Nitrogen had a direct influence on the mineral nutrient composition of pickling cucumber leaf tissue (Cantliffe, 1977).

The protein content in rice was increased by ten per cent or more by nitrogen application (Ozaki and Moriyama, 1953). Likewise, increased protein content due to increased nitrogen, phosphorus and potassium fertiliser application was observed by Kielpinski and Clerat (1954) in hay, Nandpuri and Singh (1966) in potato and Rajendran et al. (1974) in blackgram.

Verghese (1952) noticed more phosphorus and potassium content in rice from green manured plots. Gupta and Das (1954) found that organic manures like farm yard manure and green manure in combination with inorganic phosphatic fertilisers increased phosphorus content in wheat. In the case of potatoes, fertilisers and cowdung increased the potassium content (Keith and Inkson, 1958). Nilson (1979) compared the effect of organic and inorganic fertilisers in carrot, cabbage and leek and found that organic fertilisers increased the content of phosphorus and calcium in the dry matter whereas the amounts of K and Mg were uninfluenced by the fertiliser used.

2. Vitamin C

It had been observed that the level of nitrogen applied had little effect on ascorbic acid content of peas (Wilcox and Morrel, 1948) and tomato (Dastane et al., 1963). However, a reduction in ascorbic acid under high nitrogen level was reported by Anisimov (1953), in onion tops, cress leaves and pea leaves; and Jones and Embleton (1957) in oranges. High rates of nitrogen increased or did not affect ascorbic acid content in cabbages and cucumbers (Largskij, 1969). Randhawa and Bhail (1976) found that increased nitrogen application significantly increased the ascorbic acid content in cauliflower.

Schramer and Werner (1957) conducted sand culture experiments with different vegetables to find out the relation between nutrition and vitamin C content and concluded that nitrogen had negative effect while potassium had pronounced positive effect and phosphorus did not affect vitamin C content. Bolotskish (1969) found that NPK application to irrigated cucumbers improved dry matter and vitamin C contents. The effect of foliar applications of certain chemicals on fruit set and quality of muskmelon was studied by Randhawa and Singh (1970) and they reported that ascorbic acid content was enhanced by potassium, followed closely by nitrogen. Gnanankumari and Satyanarayana (1971) studied the effect of different rates of nitrogen, phosphorus and potassium on flowering, yield and composition of brinjal variety Pusa Purple Long and they found that higher rate of application of N, P_2O_5 and K_2O (280 kg/ha) produced fruits with highest amounts of vitamin A and vitamin C. In cucumber, nitrogen rates above 60 kg/ha inhibited ascorbic acid accumulation, whereas high phosphorus rates enhanced it (Largskii, 1971). Roy and Seth (1971) reported that vitamin C content of radish increased significantly due to application of fertilisers, with phosphorus and potash levels having a significant positive effect and nitrogen level an insignificant effect. Krynska et al. (1976) stated that in

cucumber also vitamin C content rose with increasing NPK rates. Subbiah and Ramanathan (1982) studied the influence of nitrogen and potassium on the crude protein, carotene and ascorbic acid content of amaranthus and found that added nitrogen enhanced crude protein and carotene contents while it decreased the ascorbic acid content; added potassium had no marked effect on carotene and ascorbic acid content.

Singh et al. (1970) studied the effect of poultry manure on cauliflower production and found that moisture, vitamin C and protein contents of the curd increased gradually with increased levels of poultry manure. A favourable influence of organic fertilisation on ascorbic acid in sweet pepper fruits was observed by Valsikova (1983).

3. Acidity and total soluble solids

Reuther and Smith (1952), Smith (1967) and Kefford and Chandler (1970) observed that N nutrition had a positive effect on soluble solids and titrable acidity but an adverse effect on the weight and solid to acid ratio of pineapple fruits. In tomato, increasing rates of potash fertilisation produced an increase in titrable acidity level and citric acid content (Bradley, 1957). But Brantley (1958) reported that potash had no effect

on soluble solids in muskmelon and watermelon and nitrogen increased the soluble solids in muskmelon only where it caused large increases in yield as well.

The effect of fertiliser combinations of nitrogen, phosphorus and potash on the per cent of soluble solids of watermelon was studied by Bradley and Fleming (1959) and they found that the percentage of soluble solids was highest when the highest rate of nitrogen was combined with phosphorus and potash. Brantley and Warren (1960) from their studies concluded that nitrogen level had no effect on percentage soluble solids in watermelon. In muskmelon higher rates of nitrogen increased the soluble solid content of fruit (Brantley and Warren, 1961).

In a trial involving GA application plus NPK nutrition on cucumber it was observed that the sugar and vitamin C contents were higher and the acid content lower in plants treated with GA and NPK (Tagmaz'Jan, 1968). But Largakij (1969) reported that high rates of nitrogen reduced total sugars in cucumbers and cabbages.

The effect of different doses of nitrogen and phosphorus on the quality of Anab-e-Shahi grapes was studied by Nijjar and Chand (1969) and they found that the total soluble solids were highest in grapes which received the medium dose of nitrogen in combination with the highest dose of phosphorus; and the control vines

produced grapes with the highest acidity. Similarly, in cucumber, nitrogen rates above 60 kg/ha inhibited accumulation of total sugars, whereas high phosphorus rates enhanced it (Largskii, 1971). Tay (1972) observed an increase in fruit acidity by higher levels of nitrogen without altering sugar content in pineapple fruits.

Attia and Nassar (1958) reported that application of pigeon manure increased the sugar content in watermelon.

4. Starch

The starch content in potato tubers was significantly increased by an increase in the level of potash whereas an increase in the level of nitrogen tended to decrease it (Hukkeri, 1968).

The carbohydrate content of cauliflower curd decreased at higher levels of poultry manure (Singh et al., 1970).

5. Yield

A fertiliser trial on Cantaloup melon with four levels of N (0, 60, 120 and 240 kg/ha) and three levels of P_2O_5 (0, 25 and 125 kg/ha) was conducted by Lingle and Wight (1960) and they found that phosphorus fertilisation was necessary for early maturity; increased nitrogen application increased yield but fertiliser

treatments had no effect on fruit size. But Bradley et al. (1961) reported that shortages of nitrogen or potash adversely affected cucumber shape. In muskmelon higher rates of nitrogen caused a reduction in total yield (Brantley and Warren, 1961). Dhesi et al. (1964) conducted a fertiliser trial on squash melon and they observed significant increase in yield with increased nitrogen application but not with phosphorus and potash application, whereas a positive yield response for phosphorus and potassium in squash melon was reported by Sutton (1965). In bitter gourd, increased nitrogen and phosphorus application increased yield whereas potash produced a slight reduction in yield (Dhesi et al., 1966). Sharma and Shukla (1972) obtained a similar result in pumpkin.

In cabbage a better yield response was obtained by the combined application of farm yard manure and ammonium sulphate than from separate applications of each (Man and Sandhu, 1956). Attia and Nassar (1958) found that in watermelon, average fruit size was increased by use of pigeon manure. In potato, farm yard manure with fertilisers produced much higher yield than mineral fertilisers alone (Haworth et al., 1966). A similar result in cabbage was reported by Khokhar et al. (1970). Application of 25 tonnes/ha of fresh cattle manure increased the yield

of egg plant and cabbage but reduced the yield of cucumber and tomato (Omori et al., 1972). Berezniewicz and Nowosielski (1973) studied the influence of organic fertilisation on vegetable yield at different levels of mineral fertilisation and they also found that plots with organic manures gave higher yield than those without them. Trials to compare inorganic and organic sources of both nitrogen and phosphorus fertilisers on potato revealed that inorganic form of these nutrients produced the maximum yield, whereas organic form produced the minimum yield (Mathan et al., 1974). But studies of Grewal and Trehan (1979) showed that tuber size and yield of potato increased significantly with both organic and inorganic sources of phosphorus and potash. Studies of Valsikova (1983) indicated the need of applying dung to sweet pepper to improve the yield as well as the quality of fruits.

B. Changes in quality factors during storage

Philips (1946) examined fruits of Cucurbita maxima and Cucurbita moschata at intervals of two weeks, three months and six months during storage and he found that conversion of starch to sugar was rapid and became practically complete after long storage. The chemical changes in Early Prolific summer squash during storage

was studied by Lorenz (1951) and he also reported that there was considerable conversion of starch to sugar during the first few days of storage.

With spinach, lettuce and tomatoes it was observed that ascorbic acid content fell rapidly during storage at room temperature while in cold storage the decrease was more gradual (Rikovski and Djorđjevic, 1952). Fish (1943) reported the effects of storage upon the ascorbic acid content of apple fruits. He observed considerable loss of ascorbic acid during the first two months of storage and a small loss of ascorbic acid in the later months. A similar change in the ascorbic acid content of winter squash was noted by Hopp and Morrow (1963). Decrease in ascorbic acid content during storage was also reported by Kholi and Bhambota (1966) in lime and Sokol and Serdyuk (1977) in pumpkin.

Gilbart and Dedolph (1964) stated that soluble solids in muskmelon remained relatively stable during storage, increasing slightly during the early storage period and decreasing slightly in the later periods. But Kholi and Bhambota (1966) reported a steady increase in total soluble solids during storage of lime fruits, whereas a decrease in total soluble solids content during storage was observed in watermelon cultivar, Sugar Baby (Abaka-Gyenin and Norman, 1977).

Decrease in acidity during storage was reported by Kholi and Bhambota (1966) in lime fruits and Salunkhe and Deshpande (1968) in peach and apricot fruits. Enni's and O'sullivan (1979) found that during storage in cucumber, total acidity declined initially and then steadily increased until the early stages of senescence.

C. Influence of organic and inorganic manures on the storage life of vegetables

Studies have given conflicting results with regard to storage life of fruits and vegetables as influenced by organic and inorganic manures.

Beaumont and Chandler (1933) reported that lack of potassium produced firmer tomato fruits which however softened more rapidly on storage.

Maiwald (1942) conducted experiments to test the effect of fertilisers on the storage life of potatoes, beets and onions and got inconsistent results.

The over application of nitrogen impaired the keeping quality of apples (Fischer and Parrith, 1951). Eggert (1961) obtained a highly significant negative correlation between nitrogen content in leaves and storage life of apple fruits and he concluded that increasing nitrogen level did result in softer fruit at and after five months in storage.

According to Elliot (1956) tomatoes grown in soilless plots receiving all nutrients in the inorganic form were more nutritious, had less disease and kept better than the tomatoes grown under standard conditions. Applications of sulphate of ammonia alone or in combination with farm yard manure to the growing crop of onion failed to record any effect on the storage quality (Singh, 1957). Pew and Gardner (1972) observed that nitrogen had little effect on melon size, earliness or storage quality.

Prasad and Futcha (1978) studied the effect of nitrogen nutrition on storage behaviour of Kagzi lime fruits and they found that loss in weight increased with storage period and nitrogen treatments were effective in minimising weight loss of fruits.

It could be evidenced from the foregone discussion that studies carried out so far to assess the effect of organic manures and inorganic fertilisers singly and in combination on quality, yield and storage life of cucurbits are inconclusive.

MATERIALS AND METHODS

MATERIALS AND METHODS

The experiment was conducted at the Main Campus of Kerala Agricultural University, Vellanikkara, with an objective of studying the effect of various organic and inorganic fertilizer treatments on the quality and storage life of oriental pickling melon (Cucumis melo var.conomon (L) Makino).

1. Materials

1.1. Site, climate, soil

The area is situated at 10.32°N latitude and 76.16°E longitude at an altitude of 22.25 metres with a typical humid tropical climate.

The soil of the experimental area is a deep well drained sandy loam with total nitrogen, phosphorus and potassium values as 0.16, 0.075 and 0.225 per cent respectively.

1.2. Season and weather conditions

The experiment was conducted during the period from September, 1983 to July, 1984. The details of meteorological observations for this period are presented in Table 1.

Table 1. Meteorological data of the experimental period

Months	Temperature		Mean relative humidity (%)	Total rainfall (mm)
	Mean maximum (°C)	Mean minimum (°C)		
1. September 1983	29.5	23.4	84.0	494.6
2. October 1983	31.2	23.1	77.0	149.8
3. November 1983	31.8	22.3	71.0	60.2
4. December 1983	31.2	23.9	63.0	24.4
5. January 1984	32.4	23.3	58.0	-
6. February 1984	34.3	24.2	56.0	27.0
7. March 1984	35.2	24.3	67.0	18.9
8. April 1984	34.5	24.9	72.6	109.2
9. May 1984	24.5	25.8	71.0	140.6

1.3. Seed material

Seeds of the oriental pickling melon variety, CS-26 released by Kerala Agricultural University was used for this study.

1.4. Manures

The organic manures used were farm yard manure, bone meal and wood ash. For inorganic manures, urea, super-phosphate and muriate of potash were used.

2. Methods

2.1. Lay out

The experiment was laid out in randomised block design with six treatments in four replications. The total number of plots were 24 with four pits per plot. The spacing adopted was 2.0 m x 1.5 m.

2.2. Treatments

T_1 Farmer's practice (Farm Yard Manure at the rate of 10 kg/pit, of which 5 kg given as basal and 5 kg as top dressing, three weeks after germination + wood ash 200 g/pit given as basal.

T_2 Inorganic fertilisers to supply 70 kg N, 25 kg P_2O_5 and 25 kg K_2O per hectare as recommended in the package of practices recommendations by the Kerala Agricultural University (Anon, 1982) which was given as the standard dose.

T_3 N, P_2O_5 and K_2O at the rate of 70, 25 and 25 kg/ha respectively supplied completely by organic manures as basal application.

T_4 Half the standard dose of 70 kg N supplied as organic manures (basal) and the remaining half as inorganic fertilisers in two equal top dressings at three and seven weeks after germination + 25 kg P_2O_5 + 25 kg K_2O (while supplying 35 kg N as farm yard manure some amount of P and K was also supplied. The remaining amount of P and K was given as inorganic fertilisers).

T_5 1½ time of the standard dose of nitrogen, phosphorus and potassium given as inorganic fertilisers.

T_6 1½ time the standard dose of nitrogen, phosphorus and potassium of which 75 per cent of N given as organic manure (basal) and 25 per cent N as inorganic fertilisers given in two equal top dressings at three and seven weeks after germination + P and K (other than what is supplied through organic manure while supplying 75 per cent of N requirement) were given as inorganic fertilisers (basal).

The farm yard manure, bone meal and wood ash used were analysed for total nitrogen, phosphorus and potassium contents and the quantity of organic

manure required for different treatments was worked out.

The data on the analysis of manures and fertilisers used in the study are furnished in Table 2. The quantity of fertilisers applied under each treatment is given in Table 3.

2.3. Field operations

The cultivation practices were as per the recommendations of the package of practices of the Kerala Agricultural University (Anon, 1982).

2.3.1. Preparation of field

The land was prepared thoroughly and pits of 30 cm depth and 60 cm diameter were made at a spacing of 2.0 m x 1.5 m. There were four pits in each plot and one replication (block) consisted of six plots.

2.3.2. Fertiliser application

The manures and fertilisers were calculated and applied according to the quantity fixed for each treatment. Full dose of phosphorus and potassium and half the dose of nitrogen were applied at the time of sowing and the remaining nitrogen was applied in two equal split doses, one at the time of vining (three weeks after germination) and the other at the time of full

blooming (seven weeks after germination).

2.3.3. Sowing

Seeds were sown at the rate of three per pit. Thinning was done two weeks after germination retaining only one healthy plant per pit.

2.3.4. Other cultural operations

The field was kept clean without any weeds. Irrigation was given on alternate days when there was no rain. Dried twigs were spread on the ground when plants started trailing.

2.3.5. Harvest

The fruits were harvested when they were fully matured.

3. Observations

The following observations were made from the study.

3.1. Quantitative characters

1. Total yield (kg)
2. Weight of the fruit (kg)
3. Length of the fruit (cm)
4. Girth of the fruit (cm)
5. Specific gravity of the fruit

3.2. Qualitative characters

The following qualitative characters of the fruits were recorded at the time of harvest and at monthly intervals for a period of five months.

1. Moisture

Moisture was estimated gravimetrically using a hot air oven.

2. Total soluble solids (TSS)

The TSS content of fruit was estimated by using an Abbe refractometer.

3. Acidity

The titrable acidity in fruit juice was estimated by titration against 0.01N NaOH using phenolphthalein as indicator and expressed as g of malic acid in 100 g of fruit juice (per cent).

4. Vitamin C

The vitamin C in fruit juice was estimated volumetrically by titration with 2,6-dichlorophenol-indophenol dye (A.O.A.C., 1960). The value was expressed as mg of ascorbic acid/100 g of fruit juice.

5. Starch

The dried fruit sample was homogenized with ethanol and centrifuged till sugar free. Then it was extracted with perchloric acid and made upto a known volume.

The starch content of the above extract was determined colorimetrically using anthrone-sulphuric acid reagent (Clegg, 1956) and expressed as percentage.

6. Crude fibre

The crude fibre content of the dried fruit sample was estimated by treating the material with 1.25 per cent sulphuric acid and then with 1.25 per cent NaOH. The material left undissolved was made fat and moisture free and dried to constant weight. The residue was ignited in a muffle furnace at 600°C to white ash and the weight of the ash was substracted from the weight of dried residue, which represented the crude fibre content (A.O.A.C., 1960).

7. Nitrogen

The nitrogen content of the dried fruit sample was estimated using Microkjeldahl digestion-distillation method (A.O.A.C., 1960).

8. Phosphorus

One gram of the dried fruit sample was digested with 15 ml of 1:1 perchloric acid, nitric acid mixture and made upto a known volume.

The phosphorus content of the diacid extract was estimated colorimetrically using the vanadomolybdo-phosphoric yellow colour method (Jackson, 1967).

9. Potassium

The potassium in an aliquot of the diacid extract of the fruit sample was determined using the flame photometer (Jackson, 1967).

3.3. Rotting percentage of fruits

The fruits were stored at room temperature by way of hanging them in wire nets from the roof of a closed room. The fruits that showed symptoms of decay were discarded. The rotting percentage in each month was calculated.

4. Statistical analysis

The data were analysed by the analysis of variance technique as described by Panse and Sukhatme (1954). The correlations of rotting percentage of fruits with chemical constituents and period of storage were also studied.

Table 2. Analytical value of manures and fertilisers used (per cent)

Manures	N	P_2O_5	K_2O
Farm yard manure	1.5	0.25	0.8
Bone meal	3.7	20.00	-
Wood ash	-	1.60	11.1
Fertilisers			
Urea	45.0	-	-
Superphosphate	-	16.00	-
Muriate of potash	-	-	60.0

Table 3. Quantity of manures applied per plant in each treatment

T_1	10 kg FYM + 200 g wood ash
T_2	57 g urea + 50 g superphosphate + 15 g muriate of potash
T_3	1.73 kg FYM + 25 g bone meal
T_4	865 g FYM + 28 g urea + 28 g superphosphate + 5 g muriate of potash
T_5	85 g urea + 75 g superphosphate + 23 g muriate of potash
T_6	1.93 kg FYM + 21 g urea + 28 g superphosphate

RESULTS

RESULTS

The data collected during the present investigation were statistically analysed and the results are presented in the following sections.

1. Yield and yield components

Data on the yield and yield components as influenced by the organic and inorganic manures are presented in Tables 4 and 5.

Observations on the fruit yield per plot showed that the maximum yield of 58.62 kg was given by T_6 which received 1½ times the standard dose of NPK with 75 per cent N as organic form. This yield was significantly superior to all other treatments. The treatments receiving NPK in the organic form alone (T_1 and T_3) recorded relatively low yield, the lowest yield of 22.10 kg/plot being recorded by T_3 which received standard dose of NPK completely as organic form and this was on par with T_1 which received farm yard manure and wood ash as per the farmer's practice. Treatments T_4 and T_5 namely standard NPK with 50 per cent N as organic form (T_4) and 1½ times of standard NPK in inorganic form (T_5) were statistically on par.

It may be seen from Table 5 that maximum number of fruits per plot (35.25) also was recorded by T_6 receiving 1½ times of standard NPK with 75 per cent N as organic

Table 4. Relative yield response as influenced by different treatments (Yield/plot, kg)

Treatments		Replications				Mean
		R_1	R_2	R_3	R_4	
T_1	FYM + wood ash	24.53	25.12	26.40	26.46	25.63
T_2	Standard NPK in inorganic form	31.89	31.17	26.19	21.09	27.59
T_3	Standard NPK in organic form	22.44	24.51	20.39	21.06	22.10
T_4	Standard NPK with 50% N as organic N	45.39	43.92	45.09	44.23	44.66
T_5	1½ standard NPK in inorganic form	45.65	44.24	48.68	46.58	46.29
T_6	1½ standard NPK with 75% N as organic N	59.89	59.74	58.37	56.51	58.62

$C.D._{(P = 0.05)} = 3.64$

form. The treatment which received only the standard dose of NPK with 50 per cent N in the organic form (T_4) also recorded relatively high value (33.00) which was on par with T_6, whereas T_5 which received 1½ times the standard NPK in inorganic form produced only 25 fruits per plot. Again low values for number of fruits per plot were recorded by T_1 and T_3 receiving only organic forms of NPK.

The maximum average fruit weight (1.85 kg) was recorded by T_5, which gave relatively high yield, in spite of its low value for number of fruits per plot. The lowest fruit weight of 1.27 kg was given by T_3 (standard NPK in organic form).

Data on the length of fruit indicated that treatments receiving 1½ times the standard NPK completely as inorganic form (T_5) produced the maximum length (33.89 cm). which was significantly higher than the other treatments. The lowest values of 27.18 and 27.91 cm were recorded by T_2 and T_1 respectively.

The variation in the breadth of fruit in relation to the treatments applied was similar to that of the length of fruit, T_5 registering the maximum value of 30.91 cm and T_2 and T_1 recording the minimum values (26.94 and 27.46 cm respectively).

The specific gravity of the fruits varied from 1.17 to 1.39. The maximum value was observed with T_3 receiving

Table 5. Effect of organic and inorganic manures on yield and yield components (Mean values)

Treatments		Yield per plot (kg)	No. of fruits per plot	Fruit weight (kg)	Length of fruit (cm)	Breadth of fruit (cm)	Specific gravity
T_1	FYM + wood ash	25.63	16.75	1.53	27.91	27.46	1.24
T_2	Standard NPK in inorganic form	27.59	21.00	1.32	27.18	26.94	1.36
T_3	Standard NPK in organic form	22.10	17.50	1.27	29.67	27.25	1.39
T_4	Standard NPK with 50% N as organic N	44.66	33.00	1.35	30.89	28.69	1.33
T_5	1½ standard NPK in inorganic form	46.29	25.00	1.85	33.89	30.91	1.17
T_6	1½ standard NPK with 75% N as organic N	58.62	35.25	1.66	32.59	29.61	1.18
	C.D.(0.05)	3.64	3.29	0.12	1.44	1.13	0.06

standard dose of NPK completely as organic form. The treatment receiving the maximum NPK as inorganic form (T_5) gave the lowest value (1.17) for specific gravity.

Moisture

Data on the mean moisture content of fruits as influenced by treatments as well as the period of storage are presented in Table 6. Treatments differed significantly in respect of the moisture content of fruits at harvest. During storage the moisture content of fruits steadily decreased irrespective of the treatments. However there was significant interaction between the treatments and the period of storage showing that the rate of decrease during storage varied with the treatments. At harvest the moisture content varied from 84.70 per cent to 90.64 per cent. The treatment receiving 1½ times the standard NPK (T_5) completely as inorganic form showed the minimum value for moisture, whereas the maximum moisture content was in fruits of T_2 which received standard dose of NPK completely in inorganic form. However, one month after harvest all the treatments except the treatment receiving standard NPK as organic form (T_3) were on par with regard to the moisture content of the fruits.

At the end of the storage period of five months the mean water content of fruits was ranging from 68.00

Table 6. Moisture content of fruits as influenced by treatments and storage period (per cent)

Treatments		Storage period (Months after harvest)						
		0	1	2	3	4	5	Mean
T_1	FYM + wood ash	89.44	83.27	82.61	80.32	76.32	73.63	80.93
T_2	Standard NPK in inorganic form	90.64	81.75	79.38	76.68	75.31	73.09	79.48
T_3	Standard NPK in organic form	84.84	74.59	74.06	73.11	70.65	68.00	74.21
T_4	Standard NPK with 50% organic N	85.38	84.12	78.13	77.37	76.68	73.92	79.26
T_5	½ standard NPK in inorganic form	84.70	83.03	81.11	77.77	75.62	73.47	79.23
T_6	½ standard NPK with 75% organic N	88.58	82.52	75.66	72.42	70.78	68.32	76.38
	Mean	87.26	81.55	78.49	76.28	74.22	71.74	

C.D. (0.05) Treatments = 0.92
Periods = 0.92
Treatments x period = 2.25

to 73.92 per cent. The treatment T_3 which recorded the minimum moisture content at one month after harvest also recorded the lowest moisture content at the end of the storage period. It was however on par with T_6 (68.32 per cent). The treatment which gave the highest value for moisture content one month after harvest (T_4) continued to maintain the trend even after 5 months of storage.

The rate of decrease in mean moisture content of fruits during the storage period of five months was maximum for the treatment receiving 1½ times the standard dose of NPK with 75 per cent organic nitrogen (T_6). In this case the moisture content of 88.58 per cent at harvest was dropped to 68.32 per cent at the end of the storage period. The rate of decrease was the least in the treatment receiving 1½ dose of standard NPK as inorganic form (T_5) where the moisture value of 84.70 per cent decreased to 73.47 per cent. The drop in T_6 and T_5 were 20.26 and 11.23 per cent respectively.

Nitrogen

Nitrogen content of fruits at harvest as influenced by the different treatments is portrayed in Table 7.

The mean values for nitrogen content varied from 1.19 to 1.82 per cent with an overall mean of 1.58. Treatments receiving the highest doses of nitrogen

Table 7. Effect of treatments on N, P and K content of fruits (expressed as percentage on moisture free basis) at harvest (Mean values)

Treatments		N	P	K
T_1	FYM + wood ash	1.19	1.08	4.41
T_2	Standard NPK in inorganic form	1.80	1.30	4.01
T_3	Standard NPK in organic form	1.26	1.43	3.97
T_4	Standard NPK with 50% organic N	1.60	0.75	4.21
T_5	1½ standard NPK in inorganic form	1.81	1.15	4.68
T_6	1½ standard NPK with 75% organic N	1.82	0.80	4.30
	Mean	1.58	1.08	4.29
	C.D. (0.05)	0.10	0.16	0.29

(T_6 and T_5) gave the highest values for nitrogen content in fruits (1.82 and 1.81 per cent respectively). The lowest value for nitrogen content was registered by T_1 which received only farm yard manure and wood ash as per the farmer's practice. Out of the treatments receiving the standard dose of nitrogen (70 kg), the treatment receiving N completely as inorganic form (T_2) exhibited relatively higher value for N content of fruits (1.60 per cent), whereas the treatment which received the same dose of nitrogen but completely as organic form contained only 1.26 per cent nitrogen in fruits.

Phosphorus

Data on the phosphorus content of fruits at harvest as influenced by the different treatments are presented in Table 7.

The mean value for phosphorus content varied from 0.75 to 1.43 per cent with an overall mean of 1.08 per cent. The treatments receiving standard dose of NPK in the organic form and inorganic form (T_3 and T_2) gave the highest values for phosphorus content in fruits (1.43 and 1.30) per cent respectively). The lowest value for phosphorus content was registered by T_4 which received standard dose of NPK with 50 per cent N in the organic form. This was on par with T_6 receiving 1½ times the

standard dose of NPK with 75 per cent organic nitrogen.

Potassium

It may be evidenced from Table 7 that the mean value for potassium content varied from 3.97 to 4.88 per cent with an overall mean of 4.29 per cent. The treatment receiving the highest dose of NPK, completely in the inorganic form (T_5) gave the highest value for potassium content in fruits (4.88 per cent). The treatments receiving standard dose of NPK either completely in the organic form or completely in the inorganic form registered relatively lower values for potassium content (3.97 and 4.01 per cent respectively). The treatments T_4 and T_6 both receiving a combination of organic and inorganic manures and the treatment T_1 receiving farm yard manure and wood ash were all on par with respect to the potassium content of fruits.

Starch

The starch content of fruits as a function of treatments and storage period is furnished in Table 8. The variation in starch content under different treatments at different periods of storage is shown in Fig.1.

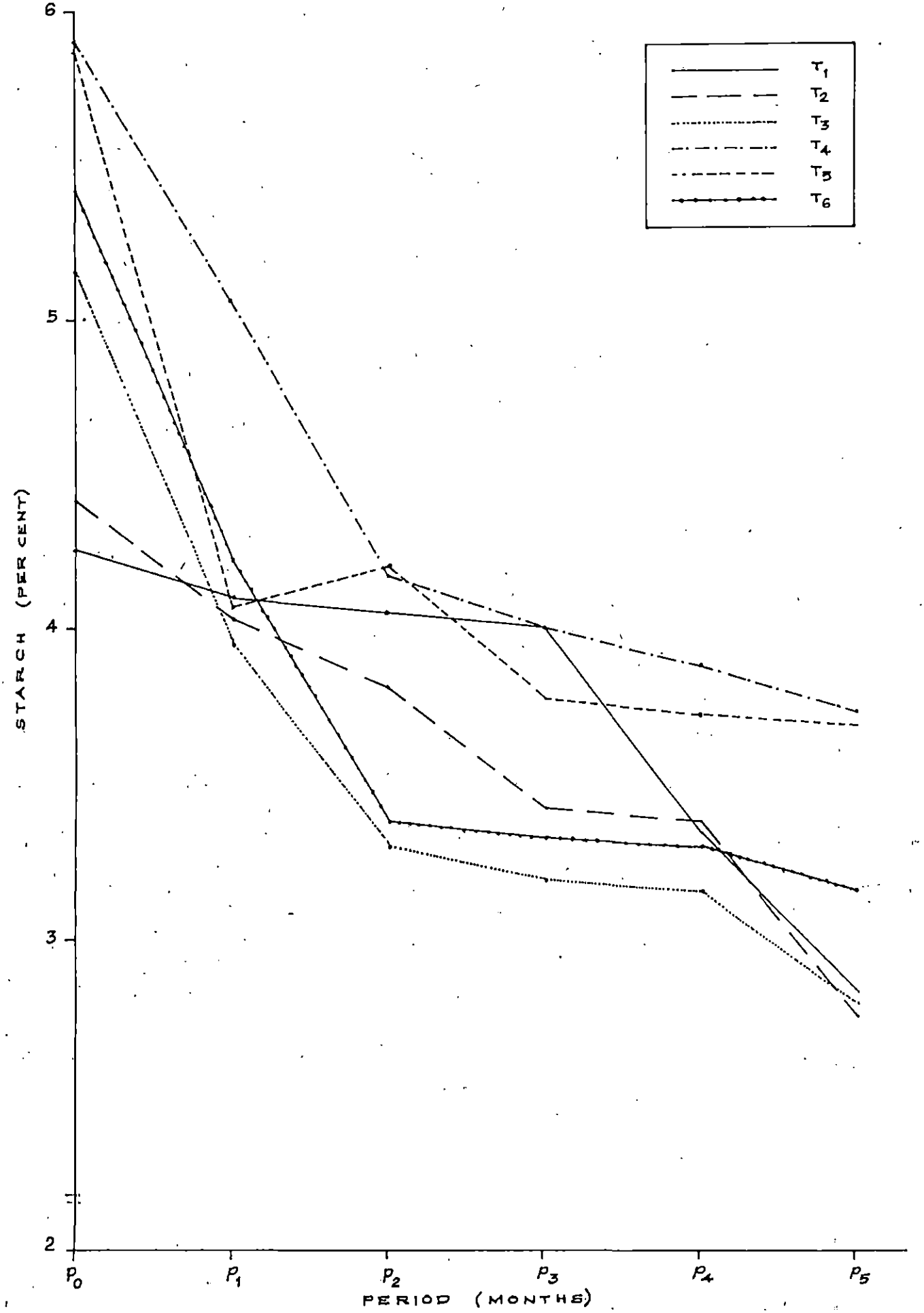
The mean starch content of fruits at different periods of storage was significantly different. In general it decreased with advancement of storage.

Table 8. Starch content of fruits as a function of treatments and storage period (per cent)

Treatments		Storage period (Months after harvest) 0	1	2	3	4	5	Mean
T_1	FYM + wood ash	4.25	4.14	4.02	4.00	3.34	2.83	3.76
T_2	Standard NPK in inorganic form	4.42	4.04	3.83	3.48	3.38	2.75	3.66
T_3	Standard NPK in organic form	5.15	3.96	3.31	3.19	3.15	2.82	3.56
T_4	Standard NPK with 50% organic N	5.90	5.07	4.18	4.00	3.88	3.73	4.46
T_5	1½ standard NPK in inorganic form	5.86	4.08	4.20	3.78	3.72	3.69	4.22
T_6	1½ standard NPK with 75% organic N	5.42	4.23	3.37	3.32	3.29	3.16	3.80
	Mean	5.17	4.25	3.82	3.63	3.46	3.12	

C.D. (0.05) Treatments = 0.21
Periods = 0.21
Treatment x Period = 0.51

FIG. 1 EFFECT OF STORAGE LIFE ON STARCH CONTENT OF FRUITS.



At the time of harvest the mean starch content was relatively more in the treatment receiving standard NPK with 50 per cent organic nitrogen and also in the treatments receiving higher dose of NPK. After one month of storage starch content decreased in all the treatments. Reduction of starch was maximum in the treatment receiving 1½ dose of standard NPK in the inorganic form and was the minimum in T_2 receiving standard NPK in the inorganic form. Thereafter all the treatments showed steady decrease in starch, content of fruits except T_5 which showed a slight increase in starch content during the second month.

After five months of storage also starch content was relatively more in the treatment receiving standard NPK with 50 per cent organic nitrogen and 1½ times the standard NPK in the inorganic form respectively.

Acidity

The acidity of fruits as influenced by different treatments and the period of storage is given in Table 9. Observations revealed that the acidity varied from 0.15 per cent to 0.20 per cent between the treatments when the values for different periods were pooled. The range of variation between the periods of storage for mean acidity of fruits was from 0.15 to 0.19 per cent.

Table 9. Acidity of fruits as influenced by treatments and storage period (per cent)

Treatments		Storage periods (Months after harvest)						
		0	1	2	3	4	5	Mean
T_1	FYM + wood ash	0.13	0.22	0.27	0.21	0.20	0.18	0.20
T_2	Standard NPK in inorganic form	0.18	0.14	0.25	0.18	0.10	0.10	0.16
T_3	Standard NPK in organic form	0.19	0.19	0.17	0.16	0.19	0.16	0.18
T_4	Standard NPK with 50% organic N	0.18	0.18	0.14	0.16	0.16	0.15	0.16
T_5	1½ standard NPK in inorganic form	0.11	0.10	0.18	0.19	0.16	0.14	0.15
T_6	1½ standard NPK with 75% organic N	0.13	0.14	0.15	0.20	0.15	0.13	0.15
	Mean	0.15	0.16	0.19	0.18	0.16	0.15	

C.D. (0.05) Treatment = 0.01
Periods = 0.01
Treatment x period = 0.03

The influence of treatments on the acidity was studied and it was found that the acidity of fruits at harvest was recorded more in T_3 which received the standard dose of NPK in the organic form. The treatment receiving 1½ times the standard dose of NPK in the inorganic form (T_5) showed the minimum value for acidity (0.11 per cent).

In general, the acidity of fruits increased with increase in period of storage upto two months after harvest and then gradually declined. Consequently the mean acidity at harvest and at the end of the storage period of five months did not differ significantly. The degree of change in acidity during storage varied with the treatments. Maximum increase in acidity during storage was shown by T_1 (farm yard manure and wood ash as per farmer's practice). The maximum decrease in acidity at the end of the storage period was obtained in T_2 which received standard dose of NPK in the inorganic form. The variation in acidity due to storage was comparatively low and gradual in the case of T_4 (standard NPK with 50 per cent organic nitrogen).

Vitamin C

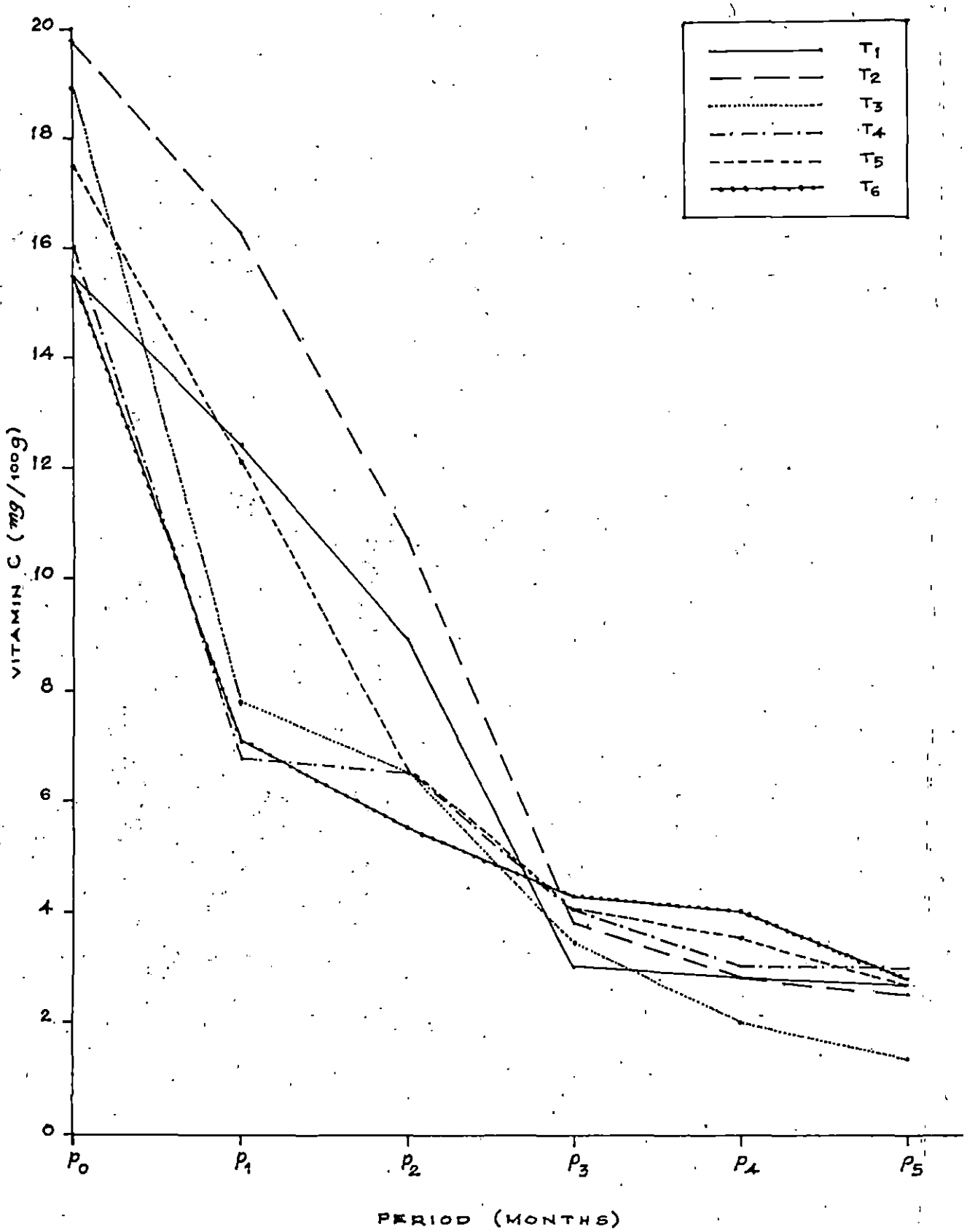
The ascorbic acid content of fruits expressed as mg/100 g (fresh weight) of fruit as influenced by the different treatments and period of storage is presented

Table 10. Vitamin C content (mg/100 g) of fruits as influenced by treatments and storage period

Treatments[1]		Storage periods (Months after harvest)						
		0	1	2	3	4	5	Mean
T_1	FYM + wood ash	15.46	12.40	8.92	3.04	2.81	2.71	7.56
T_2	Standard NPK in inorganic form	19.80	16.36	10.78	3.86	2.86	2.57	9.37
T_3	Standard NPK in organic form	18.95	7.07	6.57	3.51	2.01	1.44	6.72
T_4	Standard NPK with 50% organic N	16.00	6.85	6.57	4.07	3.05	3.04	6.60
T_5	1½ standard NPK in inorganic form	17.52	12.19	6.57	4.07	3.51	2.78	7.77
T_6	1½ standard NPK with 75% organic N	15.46	7.11	6.57	4.21	4.06	2.78	6.70
	Mean	17.20	10.46	7.67	3.79	3.05	2.55	

C.D. (0.05) Treatment = 0.44
Periods = 0.44
Treatment x period = 1.10

FIG. 2. EFFECT OF STORAGE LIFE ON VITAMIN C OF FRUITS.



in Table 10. The variation in ascorbic acid under different treatments at different periods of storage is shown in Fig.2. The vitamin C content differed significantly between treatments and at different periods of storage. The mean values ranged from 6.60 to 9.37 mg/100 g between the treatments when the values for different storage periods were pooled.

The vitamin C content was the maximum at the time of harvest in fruits of T_2 (standard NPK in the inorganic form) with 19.8 mg/100 g which was closely followed by T_3 (standard NPK in the organic form) with 18.95 mg/100 g. The treatments T_1 and T_6 recorded the least amount of ascorbic acid (15.46 mg/100 g each).

Irrespective of the fertiliser treatments the vitamin C content of fruits decreased constantly with increasing periods of storage. The decrease in vitamin C content during the initial period of storage was relatively very high. Thus the mean values for the ascorbic acid content at harvest and at one, two, three, four and five months after harvest were 17.20, 10.46, 7.67, 3.79, 3.05 and 2.55 mg/100 g respectively. At the end of the storage period the vitamin C content was minimum for the fruits belonging to T_3 which received standard NPK in the organic form. The interaction between treatment and period of storage were also

significant indicating that the variation in ascorbic acid content due to storage was different for various fertiliser treatments.

Total soluble solids (TSS)

The total soluble solids of fruits under different treatments at different periods of storage expressed as °Brix is furnished in Table 11.

The amount of total soluble solids differed significantly between treatments and at different periods of storage. The value ranged from 2.83 to 3.54°Bx for different treatments when the values for periods of storage were pooled. The minimum value was shown by T_4 which received standard dose of NPK with 50 per cent organic nitrogen. The maximum value of 3.54°Bx was recorded by T_5 which received 1½ times of the standard dose of NPK in the inorganic form.

In general the total soluble solids increased with increase in period of storage upto three months after harvest and then slightly decreased. The interaction between treatment and period of storage were also significant which showed that the rate of change in total soluble solids during the period of storage was different for different treatments.

Table 11. Total soluble solids of fruits under different treatments at different periods of storage (°Brix)

Treatments		Storage period (Months after harvest)						
		0	1	2	3	4	5	Mean
T_1	FYM + wood ash	3.00	3.00	3.00	4.75	4.00	3.00	3.46
T_2	Standard NPK in inorganic form	4.00	3.00	3.00	4.00	3.00	3.00	3.33
T_3	Standard NPK in organic form	3.00	3.00	3.00	3.00	3.00	3.00	3.00
T_4	Standard NPK with 50% organic N	2.00	3.00	3.00	3.00	3.00	3.00	2.83
T_5	1½ standard NPK in inorganic form	2.00	2.63	3.75	4.88	4.00	4.00	3.54
T_6	1½ standard NPK with 75% organic N	4.00	3.00	3.00	4.00	3.00	3.00	3.33
	Mean	3.00	2.94	3.13	3.94	3.33	3.17	

C.D. (0.05) Treatments = 0.08
Periods = 0.08
Treatment x period = 0.19

Crude fibre

The data on crude fibre content of fruits under different treatments at different periods of storage are presented in Table 12.

The treatments showed significant difference in crude fibre content of fruits, which was different at different periods of storage. The interaction effects of treatments and periods of storage in respect of crude fibre content were also significant.

At the time of harvest the treatment receiving 1½ times the standard dose of MPK with 75 per cent organic nitrogen recorded the maximum crude fibre content of 27.31 per cent and the treatments T_1, T_2 and T_3 recorded relatively smaller amounts.

After one month of storage the crude fibre content increased greatly in all the treatments except T_6. During second month it decreased in all the treatments. Thereafter crude fibre content followed an irregular distribution pattern in different treatments.

After five months of storage the crude fibre content was higher than that at harvest in the treatments T_1, T_2 and T_3 and it was lower in the remaining treatments.

Rotting percentage

The rotting percentage of fruits at different

Table 12. The crude fibre content of fruits as influenced by treatments and storage period (per cent)

Treatments		Storage period (Months after harvest						
		0	1	2	3	4	5	Mean
T_1	FYM + wood ash	14.00	21.25	14.18	18.12	16.12	15.28	16.49
T_2	Standard NPK in inorganic form	13.75	19.75	16.25	23.12	22.50	16.43	18.63
T_3	Standard NPK in organic form	14.75	21.78	18.00	22.25	12.25	20.87	18.31
T_4	Standard NPK with 50% organic N	21.83	22.43	17.00	16.00	13.81	15.93	17.84
T_5	1½ standard NPK in inorganic form	20.81	22.47	16.50	16.50	14.68	17.56	18.08
T_6	1½ standard NPK with 75% organic N	27.31	24.50	13.37	19.81	24.31	16.56	21.00
	Mean	18.74	22.03	15.88	19.30	17.29	17.11	

C.D.(0.05 Treatment = 0.96
Period = 0.96
Treatment x period = 2.36

periods of storage as influenced by the fertiliser treatment is presented in Table 13 and Fig.3. The rotting percentage differed significantly between treatments when the values for different periods of storage were pooled. It was found that the mean rotting percentage ranged from 36.09 to 53.03 per cent. Invariably, irrespective of the period of storage the highest rotting percentage was observed with fruits of T_5 which received 1½ times the standard dose of NPK in the inorganic form. The lowest value for rotting percentage was registered by T_1 (Farm yard manure and wood ash as per farmer's practice) irrespective of the period of storage.

Next to T_5 the highest value for rotting percentage was recorded by T_2 which received standard dose of NPK in the inorganic form. The increased degree of rotting in treatments which received inorganic form of NPK was evident during all the periods of storage.

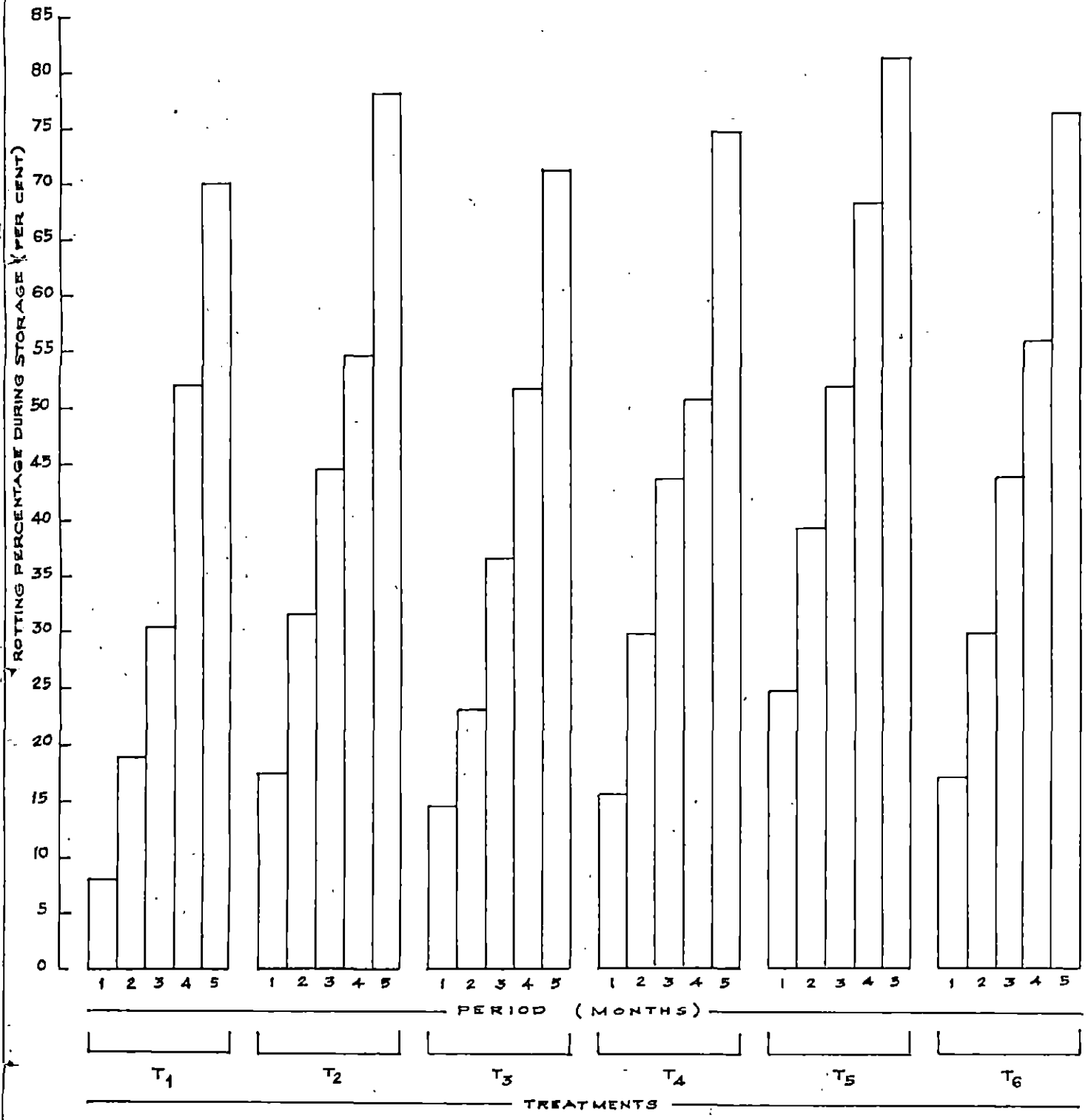
The values for rotting percentage differed significantly between the periods of storage. In general the rotting of fruits increased with the advancing period of storage. The average values for rotting percentage at one, two, three, four and five months after harvest were 16.31, 28.91, 41.50, 55.61 and 75.24 per cent respectively. The interaction between treatment and period of storage was also significant. In general the degree of increase

Table 13. Effect of treatments and storage period on rotting percentage of fruits (per cent)

Treatments		Storage period (Months after harvest					Mean
		1	2	3	4	5	
T_1	FYM + wood ash	8.25	19.19	30.71	52.19	70.13	36.09
T_2	Standard NPK in inorganic form	17.62	31.89	44.85	54.87	78.15	45.48
T_3	Standard NPK in organic form	14.74	23.33	36.60	51.70	71.11	39.50
T_4	Standard NPK with 50% organic N	15.58	29.98	41.28	50.81	73.80	42.49
T_5	1½ standard NPK in inorganic form	24.50	39.18	51.95	68.45	81.08	53.03
T_6	1½ standard NPK with 75% organic N	17.14	29.84	43.58	55.61	76.18	44.47
	Mean	16.31	28.91	41.50	55.61	75.24	

C.D.(0.05) Treatment = 1.04
Period = 0.96
Treatment x period = 2.33

FIG. 3. EFFECT OF STORAGE LIFE ON ROTTING PERCENTAGE OF FRUITS.



in rotting with advancement in period of storage was high in treatments receiving NPK in the inorganic form.

The treatment receiving the farmer's practice invariably registered minimum value of rotting percentage at all the periods of storage.

Correlation of rotting percentage with quality characters and period of storage

The correlation coefficients of rotting percentage with quality characters and period of storage are presented in Table 14.

The percentage rotting was positively and significantly correlated with the period of storage ($r = 0.976$). Since the moisture content of fruits decreased with increase in period of storage as against more rotting with the advancement in period of storage a significant negative correlation between moisture and rotting percentage was observed ($r = -0.923$). The rotting percentage was also significantly and negatively correlated with starch ($r = -0.857$) and vitamin C ($r = -0.878$) content of the fruits. All these coefficients of correlation were significant at 1 per cent level.

Table 14. Correlation coefficients of rotting percentage with quality attributes and storage period

Quality attributes	Correlation coefficient	Significance
1. Moisture	-0.923	**
2. Nitrogen	-0.027	NS
3. Phosphorus	-0.059	NS
4. Potassium	+0.050	NS
5. Starch	-0.857	**
6. Acidity	-0.002	NS
7. Vitamin C	-0.878	**
8. TSS	-0.663	NS
9. Period of storage	+0.976	**

** Significance at 1 per cent level

NS Not significant

DISCUSSION

DISCUSSION

The results of the present investigations are discussed below.

1. Yield and yield components

The treatment T_6 which received 1½ times the standard dose of NPK with 75 per cent N in the organic form gave the highest value for yield and number of fruits per plot. This treatment received the highest dose of NPK in the organic and inorganic combination, whereas the treatments (T_1 and T_3) receiving organic form of nutrients alone recorded lower yield and lesser number of fruits per plot. The treatment T_5 which received 1½ times the standard dose of NPK completely in the inorganic form also recorded relatively higher yield (46.29 kg/plot). The higher values of yield and number of fruits per plot associated with the treatment receiving 1½ times the standard dose of NPK with 75 per cent organic N may be due to the higher availability of nutrients for plant growth. The significant yield increase obtained with 75 per cent organic nitrogen may be due to the minor elements present in farm yard manure. Everett (1963) also had recorded significant yield increase with organic and inorganic fertiliser combinations in cucumber.

The treatment T_1 which received farm yard manure and wood ash as per farmer's practice contained higher amount of nutrients than all other treatments. But the yield recorded by this treatment is relatively low (25.63 kg/ plot). This may be due to the slow mineralisation rate of farm yard manure which may not provide N, P and K rapidly enough to meet the crop needs. This result is in agreement with that of Nilson (1979) who opined that the best effect of organic manures was obtained, when they were combined with mineral fertilisers. Haworth et al. (1966) also reported that in potato farm yard manure with fertilisers consistently produced much higher yield than mineral fertilisers alone. The maximum average values for fruit weight, length and breadth of fruits were recorded by the treatment T_5 which received the highest dose of nitrogen in the inorganic form. But Peterson (1958) reported that in melon level of N application did not affect early yield or average weight of fruit whereas Nijjar and Chand (1969) found that N increased the average berry weight in grapes.

2. Effect of organic and inorganic manures on quality attributes at harvest and during storage

1. Moisture

It was observed that treatments differed significantly for moisture content of fruits at harvest and

during storage the moisture content of fruits steadily decreased irrespective of the treatments. The decrease in moisture content during storage may be due to the physiological loss of water mostly due to ambient temperature dehydration of fruits. The rate of decrease in moisture content during storage varied with the treatments, the maximum being with the treatment receiving 1½ times the standard dose of NPK with 75 per cent organic N and the least, in the treatment receiving 1½ times of standard NPK in the inorganic form. Similar results had been reported by Prasad and Putcha (1978) and according to them N treatments were effective in minimising moisture loss of fruits of Kagzi lime during storage. Singh et al. (1970) found that increasing levels of poultry manure increased the moisture content of cauliflower curds.

2. Nutrients (N, P and K)

The treatments with highest doses of NPK (T_6 and T_5) gave the highest values for nitrogen content in fruits. The lowest value for nitrogen content was registered by T_1 which received only farm yard manure and wood ash as per the farmer's practice. This may be due to the slow rate of mineralisation of farm yard manure.

The treatments receiving standard dose of N in the organic form and inorganic form (T_3 and T_2) gave the highest values for phosphorus content in fruits whereas

the treatments which received highest doses of NPK recorded relatively lower values for mean phosphorus content. This observation is in agreement with that of Thomas and Mc Lean (1967) who concluded that in squashes increasing the N concentration raised the nitrogen content and reduced phosphorus content in plant tissue. Eventhough the phosphorus content of superphosphate is high, the treatment which received the highest dose of phosphorus recorded only lower values for phosphorus content. The phosphorus fertilisers were given only at the time of sowing. The inorganic phosphorus fertiliser given was superphosphate. The phosphorus in this fertiliser is in water soluble form; but it gets fixed up in laterite soil which has high P fixing capacity. So its availability to the growing crop will be less. The organic phosphorus was supplied through bone meal. Even though bone meal contains water insoluble form of phosphorus, the soil acidity results in the dissolution of phosphorus in bone meal which will be available to the growing crop. This may be the reason for the highest phosphorus content in the treatment T_3.

The highest value for potassium content was recorded by the treatment receiving the highest dose of NPK in the inorganic form and relatively lower values for potassium content was observed in the treatments receiving standard

dose of NPK either completely in the organic form or completely in the inorganic form. The higher potassium content in the treatment which received the highest dose of NPK in inorganic form is due to the higher availability of potassium from muriate of potash in this treatment.

3. Starch

The treatments showed significant difference for starch content. At harvest the mean starch content was relatively more in the treatments receiving standard NPK with 50 per cent organic N and higher dose of NPK. In general starch content decreased with advancement of storage period. This is due to the conversion of starch to sugars. Phillips (1946) in Cucurbita maxima and Cucurbita moschata and Lorenz (1951) in Cucurbita pepo studied the chemical changes during storage and found considerable amount of conversion of starch to sugar during storage period.

4. Acidity

The highest acidity of fruits was recorded by T_3 which received the standard dose of NPK completely in the organic form and the treatment receiving 1½ times of the standard dose of NPK in the inorganic form (T_5) showed the minimum value for acidity. Tagmazjan (1968) reported

lower acid content in plants treated with GA and NPK whereas Reuther and Smith (1952), Smith (1967) and Kefford and Chandler (1970) observed that N nutrition had a positive effect on titratable acidity of pineapple fruits. But Su (1957) and Py (1958) reported a decrease in acidity with increase in N application in pineapple. Nijjar and Singh (1979) also reported a decreased acidity with increased nitrogen in Thompson Seedless grapes.

During storage the acidity of fruits increased upto two months after harvest and then gradually declined. Starch hydrolysis results in production of monosaccharides which can be converted into plant acids. This may be the reason for increase in acidity during initial periods of storage. However the loss of acidity in later stages may be due to its utilisation in the metabolic process during storage. Decrease in acidity during storage was reported by Kholi and Bhambota (1966) in lime, Salunkhe and Deshpande (1968) in peach and apricot and Prasad and Putcha (1970) in kagzi lime. An increase in acidity during storage was reported by Chinnaswamy (1963) in tomato. However Abaka-Gyenin and Norman (1977) observed an increase in acidity during first week of storage and a decrease during the second week in watermelon.

5. Vitamin C

The vitamin C content differed significantly between treatments and between periods of storage. At harvest the maximum vitamin C content was found in fruits of T_2 (standard NPK in the inorganic form) which was closely followed by T_3 (standard NPK in organic form). The least amount of ascorbic acid during harvest was noted in T_1 and T_6. Anisimov (1953) found that moderate amounts of N increased the vitamin C content of onion tops and pea leaves whereas excessive doses depressed it. Jones and Embleton (1967) in oranges, Ghanti (1969) in sweet orange and Largekii (1971) in cucumber reported that high N levels decreased the ascorbic acid content whereas Wilcox and Morrel (1948) in peas and Deatene et al. (1963) in tomato reported that vitamin C content was not affected by nitrogen level.

Irrespective of the fertiliser treatments the vitamin C content of fruits decreased constantly with increasing periods of storage. The rate of decrease was relatively high during the initial period of storage. Fish (1943) reported a similar result in apple. He observed a considerable loss of ascorbic acid during the first two months of storage and a small loss of ascorbic acid during the later months. Hopp and

Morrow (1963) found that in winter squash the ascorbic acid content decreased during storage with 2/3rd of the loss occurring during the first five weeks of storage.

The decrease in ascorbic acid content may be due to its oxidation to dehydro ascorbic acid.

6. Total soluble solids (TSS)

The total soluble solids content differed significantly between treatments. The maximum being 5.54°Bx recorded in the treatment which received the highest dose of NPK completely as inorganic form. Brantley (1958) reported that nitrogen increased the soluble solids in muskmelon. Only where it caused large increase in yield, whereas Bradley and Fleming (1959) reported that in watermelon percentage soluble solids was highest when the highest rate of NPK was used.

During storage the total soluble solids increased upto three months after harvest and then slightly declined. The initial increase can be attributed to the hydrolysis of starch which produces monosaccharides. The gradual decline in the later stages may due to its utilisation in metabolic process. Gilbert and Dedolph (1964) reported an identical trend in total soluble solids during storage in muskmelon.

Rotting percentage

The highest rotting percentage was observed with fruits under the treatment which received the highest dose of NPK completely in the inorganic form followed by the treatment which received standard dose of NPK completely in the inorganic form. The lowest value for rotting percentage was registered by the treatment which received farm yard manure and wood ash as per farmer's practiced followed by T_3 (standard NPK completely in the organic form) and T_4 (standard NPK with 50 per cent organic N). The effect of organic manures in reducing the rotting percentage is well evidenced from the results. The higher percentage of rotting in treatments with inorganic fertilisers (T_5 and T_2) may be possibly due to their effect on cell wall structure and moisture content of fruits. It may be concluded from the present study that organic form of manures hold a definite advantage over inorganic fertilisers in respect of the storability of oriental pickling melon.

SUMMARY

SUMMARY

1. The oriental pickling melon (Cucumis melo var. conomon (L) Makino) was grown in a randomised block design under different levels of organic and inorganic fertiliser treatments with four replications, at the main campus of Kerala Agricultural University, Vellanikkara.

2. The experiment was conducted to study the effect of organic and inorganic fertilisation on the yield, quality and storage life of oriental pickling melon. The comparative yield response of oriental pickling melon to the organic and inorganic manures was assessed by recording the parameters like yield per plot, number of fruits per plot, average fruit weight, length, girth and specific gravity of fruit. The effect of organic and inorganic manures on the quality of oriental pickling melon was determined at room temperature by estimating the quality attributes like moisture, starch, vitamin C, acidity, total soluble solids and crude fibre content of fruits at harvest and thereafter at monthly intervals during storage. The nutrient content of fruits at harvest was also estimated. The effect of organic and inorganic fertilisation on the storage life of oriental pickling melon was assessed by estimating the rotting percentage of fruits during storage.

3. The yield response of oriental pickling melon to different treatments was significantly different. The fruit yield per plot and number of fruits per plot was maximum in the treatment which received 1½ times the standard dose of NPK with 75 per cent N in the organic form, whereas the treatments which received NPK through organic manures alone recorded relatively lower yield. The average fruit weight, length and girth of fruits were observed maximum in the treatment which received 1½ times the standard dose of NPK completely through inorganic fertilisers.

4. Maximum nitrogen content in fruits was observed for treatments which received the highest dose of NPK either completely through inorganic fertilisers or through a combination of organic and inorganic fertilisers. The lowest value for N content was registered by the treatment which received only farm yard manure and wood ash as per the farmer's practice. The highest phosphorus content was not associated with the treatments which received the highest doses of NPK. A combination of organic manures and inorganic fertilisers decreased the phosphorus content of fruits. The treatment which received the highest dose of NPK completely in the inorganic form gave the highest value for potassium content in fruits.

5. At harvest moisture content of fruits was maximum in the treatment which received standard dose of inorganic fertilisers. During storage the moisture content of fruits steadily decreased in all the treatments but the rate of decrease in moisture varied with the treatments. It was minimum in the treatment which received the highest dose of inorganic fertilisers.

6. The starch content of fruits was maximum in the treatment which received standard dose of NPK with 50 per cent organic N followed by the treatments which received highest dose of NPK. The starch content decreased with the advancement in storage period.

7. At harvest acidity of fruits was maximum in the treatment which received standard dose of NPK completely through organic manures and minimum in the treatment which received the highest dose of NPK completely through inorganic fertilisers. During storage acidity followed an initial increase followed by a gradual decline.

8. The ascorbic acid content of fruits showed significant difference under different treatments. At harvest the vitamin C content was maximum in the treatment which received standard dose of NPK in inorganic form. Irrespective of the fertiliser treatments the vitamin C content of fruits decreased constantly during storage.

The maximum loss of vitamin C during storage occurred in the treatment which received standard dose of NPK in the organic form.

9. The total soluble solid content differed significantly between treatments. The maximum value was recorded in the treatment which received the highest dose of NPK completely through inorganic fertilisers and minimum value by the treatment which received standard dose of NPK with 50 per cent organic N. The total soluble solids content of fruits increased upto three months after harvest and then slightly declined during storage.

10. The highest rotting percentage was observed with fruits in the treatment which received the highest dose of NPK completely in the inorganic form followed by the treatment which received standard dose of NPK in the inorganic form. The lowest value for rotting percentage was registered by the treatment which received farm yard manure and wood ash as per farmer's practice. The rotting of fruits increased with the advancing period of storage. The increased degree of rotting in treatments which received inorganic form of NPK was evident during all periods of storage. The organic form of manures showed a definite advantage over inorganic fertilisers in respect of the storability of oriental pickling melon.

11. The percentage rotting was positively and significantly correlated with the period of storage whereas it was negatively and significantly correlated with moisture, starch and vitamin C content of fruits.

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*Original not seen

APPENDICES

APPENDIX-I

Analysis of variance table for yield and its components

Source of variation	d.f.	MS					
		Yield per plot (kg)	Number of fruits per plot	Average fruit weight (kg)	Length of fruit (cm)	Breadth of fruit (cm)	Specific gravity
Replications	3	6.603	6.944	0.018	1.154	0.723	0.002
Treatments	5	840.885**	247.200**	0.202**	27.462**	9.104**	0.034**
Error	15	5.840	4.770	0.007	0.915	0.571	0.002

**Statistical significance at 1 per cent probability level (P = 0.01)

APPENDIX-II

Analysis of variance table for moisture, acidity, vitamin C, starch and crude fibre content of fruits

Source of variation	d.f.	M.S.				
		Moisture	Acidity	Vitamin C	Starch	Crude fibre
Replications	3	3.263	0.00055	0.509	0.051	0.294
Treatments	5	146.516**	0.01000**	26.980**	3.000**	55.803**
Periods	5	744.078**	0.00870**	771.988**	12.674**	110.414**
Treatment x periods interaction	25	13.668**	0.00470**	12.348**	0.407*	49.394**
Error	105	2.570	0.00060	0.611	0.136	2.813

* Statistical significance at 5 per cent probability level (P = 0.05)

** Statistical significance at 1 per cent probability level (P = 0.01)

QUALITY AND STORAGE LIFE OF ORIENTAL PICKLING MELON [*Cucumis melo* var. *conomon* (L) Makino] AS INFLUENCED BY MAJOR NUTRIENTS

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ABSTRACT

The oriental pickling melon (Cucumis melo var. conomon (L) Makino) was grown in a randomised block design under different organic and inorganic fertiliser treatments, with four replications at the Main Campus of Kerala Agricultural University, Vellanikkara, to study the effect of organic and inorganic manures on the yield, quality and storage life of this crop.

The yield response of oriental pickling melon to different treatments was found to be significantly different. The treatment which received the highest dose of NPK in the organic and inorganic combination recorded the maximum yield per plot and number of fruits per plot whereas the treatments which received NPK through organic manures alone recorded relatively low yield. The weight and size of fruits were maximum when the highest dose of NPK was given completely in the inorganic form.

The quality of the fruit was assessed by estimating the nutrient content at harvest; moisture, acidity, vitamin C, starch, total soluble solids and crude fibre content of fruits at harvest and thereafter at monthly intervals during storage. Significant difference was observed between treatments for these quality characteristics. During storage moisture, starch and vitamin C content of

fruits showed steady decline irrespective of the treatments, whereas acidity and total soluble solids showed an initial increase followed by a gradual decline.

The effect of organic and inorganic manures on storage life of oriental pickling melon was assessed by recording the rotting percentage of fruits during storage and it was found that increased degree of rotting occurred in treatments which received inorganic form of NPK, during all periods of storage. The organic form of manures showed a definite advantage over inorganic fertilisers in respect of the storability of oriental pickling melon.