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PERFORMANCE OF SUNFLOWER VARIETIES UNDER GRADED DOSES OF NITROGEN IN REDLOAM SOILS OF KERALA

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Growth and yield of sunflower (*Helianthus annuus*) is limited more often by nitrogen than by any other essential element. Increase in growth, yield and yield attributes in sunflower due to nitrogen application has been reported by Massey (1971), Mukundan (1972), Ramaswamy (1973), Singh *et al* (1973) and Thomas Varghese (1973). Sunflower, being a new introduction into Kerala, only very little work had been undertaken and hence an experiment was conducted to find out the performance of different varieties of sunflower under varying levels of nitrogen.

Materials and Methods

The experiment was conducted during May to August 1974. The soil of the experimental area was red loam with 0.050 per cent total nitrogen, 0.0085 per cent available P_2O_5 and 0.0018 per cent available K_2O. The pH of the soil was 5.4. The varieties tried were EC.68413 (Vniimk 8931), EC.68414 (Peredovik) and Sunrise selection. The former two were Russian varieties and the latter was of Canadian origin. These varieties were grown under three nitrogen levels viz. 40, 80 and 120 kg per hectare. A uniform dose of 60 kg each of P_2O_5 and K_2O per hectare was also given. Half the dose of nitrogen was applied as basal and the remaining half as top dressing on the 30th day after planting. Observations were made on growth and yield.

Results and Discussion

The mean values for the various observations taken are given in Table 1 to 4.

A. Performance of varieties

Growth characters, yield and yield attributes of different sunflower varieties are given in Table 1.

There was no significant difference in plant height and total dry matter production among the varieties. However, the variety sunrise selection recorded a slightly lower height than the first two. Regarding leaf area index also there was no difference. The net assimilation rate between flowering and harvesting did not show any significant difference. Thus the two Russian varieties and the Canadian variety performed more or lesss uniformly in these characters.

Table 1

Growth characters, yield and yield attributes of sunflower varieties

Character studied	EC.68413	EC.68414	Sunrise selection	F	SE	CD (0.05)
Height of plant (cm)	115.82	115.92	110.94	NS	2.263	—
Total dry matter production (g/3 plants)	168.64	169.72	153.83	NS	5.758	—
Leaf area index at flowering	1.60	1.620	1.664	NS	8.092	—
Leaf area index at harvest	2.36	2.332	2.119	NS	0.087	—
NAR between flowering and harvesting	1.39	1.51	1.30	NS	0.151	—
Percentage of lodging	32.05	35.05	38.06	NS	1.925	—
Head diameter (cm)	12.72	13.33	12.17	NS	0.336	—
No. of seeds per head	475.50	510.78	500.78	NS	20.690	—
Percentage of filled seeds per head	63.63	66.83	65.69	NS	1.530	—
1000 seed weight (g)	65.22	61.69	64.00	NS	1.680	—
Yield of seeds (kg/ha)	1829.50	1723.30	1653.50	NS	64.965	—
Yield of stover (kg/ha)	4345.50	4291.70	3908.40	Sig	88.970	260.960
Oil content of seeds (%)	37.20	40.99	37.58	Sig	0.387	1.134
Protein content of seeds (%)	23.21	23.72	23.13	Sig	0.152	0.455

Lodging was noticed in all the above three varieties, but the difference was not significant. The head diameter ranged from 12.17 to 13.33 cm, EC. 68414 recording the maximum. Here again, there was no significant difference. The number of seeds per head was maximum in EC. 68414 and minimum in EC. 68413, the difference being not significant. The same trend was also noticed in the case of percentage of filled grains per head. Regarding the 1000 seed weight, there was no signifcant variation, but EC. 68413 gave slightly higher value when compared to the other varieties.

The varieties did not show any significant difference in the yield of seeds showing that all of them could be successfully cultivated in this state.

Table 2

Effects of levels of nitrogen on head diameter (in cm).

N—level	EC.68413	EC.68414	Sunrise selection	Mean
n_{40}	11.23	11.93	11.13	11.43
n_{80}	12.89	13.47	12.32	12.89
n_{120}	14.03	14.58	13.05	13.89
Mean	12.72	13.33	12.17	...
CD (0.05) for comparing marginal means				: 0.985
,, ,. combinations				: 1.706

Table 3

Effect of nitrogen levels on number of seeds per head

N levels	EC.68413	EC.68414	Sunrise selection	Mean
n_{40}	464.67	490.67	499.00	484.78
n_{80}	457.17	602.17	532.17	530.50
n_{120}	513.67	439.50	571.17	470.78
Mean	475.50	510.78	500.78	...
CD (0.05) for comparing marginal means				: 60.68
,, ,, combinations				: 105.11

The varieties EC. 68413 and EC. 68414 were on par, but both superior to sunrise selection with respect to yield of stover. The height of plants and dry matter production were higher in EC. 68413 and 68414 than in Sunrise selection though not significant. These two characters might have contributed together for a significant increase in the yield of stover in these two varieties.

EC. 68414 was significantly superior to Sunrise selection and EC. 68413 with respect to oil content and the latter two were on par. EC. 68414 recorded the maximum oil content of 40.99 per cent. Protein content of seed was also

Table 4

Effect of nitrogen levels on yield of sunflower (kg/ha).

N level	EC.68413	EC.68414	Sunrise selection	Mean
n_{40}	1532.6	1565.5	1639.7	1579.3
n_{80}	2060.0	1981.0	1620.2	1887.1
n_{120}	1895.7	1623.4	1700.6	1739.9
Mean	1829.5	1723.3	1653.5	...

CD (0.05) for comparing marginal means : 190.5
,, ,, combinations : 330.0

significantly different in these varieties. EC. 68414 was superior to EC. 68413 and Sunrise selection and the latter two were on par. EC. 68413 recorded the maximum protein content of 23.72 per cent.

B. Effect of nitrogen

The effects of graded doses of nitrogen on head diameter number of seeds per head and yield of sunflower are given in Tables 2, 3 and 4 respectively.

Nitrogen was found to have marked influence on the head diameter. The level of 120 kg nitrogen per hectare gave the maximum head diameter and was significantly superior to 80 kg which in turn was superior to 40 kg nitrogen per hectare. The varieties did not show any appreciable variation in head diameter.

There was no significant difference in number of seeds per head due to levels of nitrogen. However, nitrogen at 80 kg per hectare gave the highest number of seeds per head. Varieties also did not show any significant difference in this character.

Application of graded doses of nitrogen recorded significant difference in yield of seeds. The highest yield of 1887 kg seeds per hectare was recorded at 80 kg nitrogen per hectare. The difference in yield obtained at 60 kg and 120 kg nitrogen per hectare was not significant. The maximum yield due to nitrogen at 80 kg per hectare as obtained in the present investigation may be contributed to the combined effect of all the yield components at this level.

Summary

An experiment using three varieties of sunflower and three levels of nitrogen was conducted at the College of Agriculture, Vellayani during 1974 inorder

to assess the performance of sunflower varieties under different levels of nitrogen. The varieties tried were EC.68413, EC.68414 and Sunrise selection. The levels of nitrogen were 40 kg, 90 kg and 120 kg per hectare. The results indicated that there was no significant difference among the varieties in plant height, total dry matter production, leaf area index net assimilation rate, lodging, head diameter, number of seeds per head, percentage of filled grains per head, 1000 seed weight and yield of seeds. But, there was significant difference in the yield of atover and oil and protein contents of seeds among them. The effects of incremental doses of nitrogen were significant in head diameter and yield of seeds. Maximum yield of 1887.1 kg seeds per hectare was obtained at 80 kg nitrogen per hectare.

സംഗ്രഹം

ചുന്നവ ലോം മണ്ണിൽ, ഇ.സി. 68413, ഇ.സി. 68414, സൺറൈസ് സെലക്ഷൻ എന്നീ സൂര്യകാന്തി ഇനങ്ങൾക്ക് ഹെക്ടറിന് 40, 80, 120 കിലോഗ്രാം എന്ന തോതിൽ നൈട്രജൻ ചേക്കുമ്പോഴുണ്ടാകുന്ന പ്രതികരണം പഠിക്കുന്നതിനായി 1974 raJ വെള്ളായണി കാർഷിക കോളേജിൽ ഒരു പരീക്ഷണം നടത്തുകയുണ്ടായി. പരീക്ഷണഫലത്തിൽ നിന്നും, ചെടിയുടെ ഉയരം, മൊത്തത്തിലുള്ള വളർച്ച, ലീഫ് ഏറിയ ഇൻഡക്സ്, നെറ്റ് അസിമിലേഷൻ റേറ്റ്, ചാഞ്ഞു വീഴൽ, പൂങ്കുലയുടെ വ്യാസം, ഓരോ പൂങ്കുലയിലുമുള്ള വിത്തുകളുടെ എണ്ണം, വിത്തിന്റെ തൂക്കം, മൊത്തത്തിലുള്ള വിത്തുല്പാദനം എന്നിവയിൽ വിവിധയിനങ്ങൾ തമ്മിൽ പറയത്തക്ക വ്യത്യാസങ്ങൾ പ്രകടിപ്പിച്ചതായി കണ്ടില്ല. എന്നാൽ, വിത്തിലുള്ള എണ്ണയുടെയും മാംസ്യംശത്തിന്റെയും അളവിൽ ഗണ്യമായ വ്യത്യാസം അനുഭവപ്പെട്ടു. നൈട്രജന്റെ തോതു് വർദ്ധിപ്പിച്ചതിനനുസരിച്ചു് വിളവുല്പാദനവും വർദ്ധിച്ചതായി കണ്ടു. ഏറ്റവും കൂടിയ ശരാശരി വിളവായ 1887.1 കിലോഗ്രാം വിത്തു് ഹെക്ടറിന് 80 കിലോഗ്രാം എന്ന തോതിൽ നൈട്രജൻ ffinj(?)«5T(»(5raJo»osrTD"ലഭിച്ചതു്. പ്രായപ്പെട്ട മൂന്നിനങ്ങളും കേരളത്തിൽ കൃഷിചെയ്യാമെന്നു് വ്യക്തമായി തെളിഞ്ഞു.

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