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RESEARCH PAPER

Response of wheat varieties to different levels of fertilizer on growth and yield under late sown condition

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Abstract : A field experiment was conducted at Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *Rabi* season of 2009-10 with a view to find out a response of different fertilizer levels and varieties on growth and yield of wheat and to find interaction effect of fertilizer levels and varieties. The results of study showed that the fertilizer level 120:60:60 kg NPK ha^{-1} was found beneficial in improving growth characters, yield attributes and yield as compared to 80:40:40 kg NPK ha^{-1}, 100:50:50 kg NPK ha^{-1} and 150:75:75 kg NPK ha^{-1} under late sown condition. Variety Lok-1 proved to be superior in growth characters, yield attributes and yield as compared to SKFPS–645 and NIAW–34 under late sown condition.

Key Words : Wheat varieties, Fertilizer levels, Late sown wheat

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is the world's most widely cultivated food crop providing ample food calories and protein for more than one thousand million human beings in the world. Common wheat is grown across a wide range of environment around the worlds. Among major cereals, globally wheat ranks first in area and production. Wheat contributes 25 per cent production to the total food grain production. In Maharashtra area under wheat is 12.53 million hectares and production is 23.71 million tonnes (Anonymous, 2009). In wheat, time of sowing is one of the important aspects for obtaining good yield. It has marked influence on the yield of wheat (Mishra *et al.*, 2003). In fact, the optimum time of sowing depends on the type of variety (duration), weather conditions, land preparation and availability of inputs. The growth and yield of late sown wheat is less as compared to timely sown irrigated wheat. Sowing of wheat is delayed generally due to late harvest of some *Kharif* crops and resulted in poor yield. The delayed sowing also affect the efficiency of inputs such as fertilizer and water. However, the adoption of improved agronomic practices, suitable varieties and fertilizer dose can increase crop productivity. Growing suitable late sown varieties with proper dose of fertilizer increase growth and yield of crop.

MATERIAL AND METHODS

The field trial was conducted during *Rabi* season of 2009-2010 at Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The topography of the experimental plot was fairly leveled. There were 4 main plot assigned for the levels of fertilizers F_1- 80:40:40 kg NPK

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ha^{-1}, F_2-100:50:50 kg NPK ha^{-1}, F_3-120:60:60 kg NPK ha^{-1}, F_4-150:75:75 kg NPK ha^{-1} and 3 sub-plots allocated to different varieties of wheat V_1-SKFPS-645, V_2-NIAW-34, V_3-Lok-1 under Split Plot Design with three replications. The soil was alkaline in reaction (pH 8.02), poor in organic carbon (0.98 %), low in available nitrogen (153.60 kg/ha), medium in available phosphorus (14.83 kg/ha) and high in potassium (562.64 kg/ha). All the recommended dose of fertilizers *i.e.* NPK, were applied at the time of sowing. Sowing was done on 30th December 2009 by hand sowing method at 22.5 cm row to row distance with weighed quantity of seed for each row and harvested on 2nd April 2010. The total rainfall received during experimental period was 43.6 mm. Biometric observations were recorded by selecting five plants from each plot randomly and marked with proper rotations. These plants were harvested at maturity separately for assessing individual plant yield. The growth parameters and yield parameters were studied.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Growth characters :

Plant height :

Data in Table 1 revealed that the effect of fertilizer levels observed to be pronounced crop growth. Application of 120:60:60 kg NPK ha^{-1} produced significantly more plant height than 80:40:40 kg NPK ha^{-1}, 100:50:50 kg NPK ha^{-1} and it was at par with 150:75:75 kg NPK ha^{-1}. Similar result were found by Nikam (1985).

Plant height was to be increased continuously up to harvest. Effect of varieties on mean plant height was found significant at all crop growth stages. Variety Lok-1 recorded significantly more plant height than SKFPS-645 and NIAW-34.

Number of tillers :

The number of effective tillers per plant was significantly influenced by different fertilizer levels. Application of fertilizer level 120:60:60 kg NPK kg/ha recorded significantly more number of effective tillers over rest of the fertilizer levels *viz.*, 80:40:40 kg NPK/ha, 100:50:50 kg NPK/ha and it was at par with 150:75:75 kg NPK/ha. Similar findings were reported by Girothi *et al*. (1987).

The number of effective tillers per plant was significantly influenced by different treatment. The number of effective tillers per plant recorded significantly higher in variety Lok-1 than the varieties SKFPS-645 and NIAW-34 .

Number of functional leaves :

The number of functional leaves and leaf area are important indicator of total source available to the plant for production of photosynthesis. The fertilizer level 120:60:60 kg NPK ha^{-1} recorded significantly higher number of leaves than 80:40:40 kg NPK ha^{-1}, 100:50:50 kg NPK and it was at par with 150:75:75 kg NPK ha^{-1}.

Among varieties, Lok-1 produce significantly more number of functional leaves.

Table 1 : Growth attributing characters of wheat as influenced by different treatments at various stages of crop growth

Treatments	Plant height (cm)	No. of effective tillers $plant^{-1}$	No. of functional leaves $plant^{-1}$	leaf area $plant^{1}$ (dm^2)	Dry matter production (g/plant)
Fertilizer levels (F)					
F_1-80:40:40kg NPK ha^{-1}	67.22	3.37	9.93	4.27	4.85
F_2-100:50:50kg NPK ha^{-1}	68.55	3.82	11.04	4.70	5.56
F_3-120:60:60kg NPK ha^{-1}	70.66	4.42	12.04	5.47	6.43
F_4-150:75:75kg NPK ha^{-1}	69.16	4.13	11.90	5.16	6.31
S.E. ±	0.22	0.04	0.06	0.03	0.21
C.D. (P=0.05)	0.68	0.13	0.18	0.09	0.65
Varieties (V)					
V_1-SKFPS 645	68.25	3.71	10.93	4.77	5.48
V_2- NIAW-34	68.87	3.85	11.25	4.85	5.72
V_3 -LOK-1	69.58	4.25	11.50	5.08	6.15
S.E. ±	0.16	0.08	0.07	0.05	0.21
C.D. (P=0.05)	0.49	0.24	0.22	0.15	0.63
Interaction (F×V)					
S.E. ±	0.32	0.16	0.15	0.11	0.4
C.D. (P=0.05)	NS	NS	NS	NS	NS
G.M.	68.89	3.935	11.22	4.9	5.78

NS=Non-significant

Table 2 : Yield attributing characters of wheat as influenced by different treatments at various stages of crop growth

Treatments	Wt. of panicle (g)	Wt.of grains per panicle (g)	Test weight (g)	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)
Fertilizer levels (F)						
F_1-80:40:40kg NPK ha^{-1}	1.96	1.36	38.84	18.01	26.60	39.84
F_2-100:50:50kg NPK ha^{-1}	2.12	1.58	40.21	19.94	29.33	40.44
F_3-120:60:60kg NPK ha^{-1}	2.41	1.78	42.61	24.52	32.94	42.54
F_4-150:75:75kg NPK ha^{-1}	2.19	1.69	41.66	22.15	30.71	40.74
S.E. ±	0.02	0.06	0.48	1.0	0.76	0.83
C.D. (P=0.05)	0.07	0.18	1.45	3.01	2.30	2.48
Varieties (V)						
V_1-SKFPS 645	2.10	1.55	39.70	19.79	28.68	39.47
V_2- NIAW-34	2.20	1.60	40.66	20.02	29.88	40.13
V_3 -LOK-1	2.27	1.66	41.79	23.67	31.12	43.07
S.E. ±	0.01	0.06	0.57	0.62	0.38	0.62
C.D. (P=0.05)	0.04	0.18	1.73	3.75	1.15	1.88
Interaction (F×V)						
S.E. ±	0.03	0.01	1.15	1.25	0.77	1.25
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
G.M.	2.17	1.60	40.78	21.15	29.81	40.89

NS=Non-significant

Leaf area :

Application of fertilizer level 120:60:60 kg NPK ha^{-1} recorded maximum leaf area per plant and it was found significantly higher over rest of the fertilizer levels.

Effect of variety on mean leaf area per plant was significant. Variety Lok-1 recorded significantly more leaf area than SKFPS - 645.

Dry matter accumulation :

Application of 120:60:60 kg NPK ha^{-1} recorded significantly higher drymatter production than 80:40:40 kg NPK ha^{-1} and 100:50:50 kg NPK ha^{-1} but it was at par with application of 150:75:75 kg NPK ha^{-1}.

Dry matter accumulation process was continuous from emergence to maturity of the crop. Variety Lok-1 recorded higher dry mater accumulation over. SKFPS- 645 and NIAW - 34 and it was at par with NIAW-34 (Tyagi *et al*., 2004 and Tewari and Singh, 1995).

Yield and yield attributes :

The data depicted in Table 2 showed that the yield attributing characters includes weight of panicle (g), weight of grains per panicle (g) and test weight (g) were highest with the application of 120:60:60 kg NPK ha^{-1} than 80:40:40 kg NPK ha^{-1}, 100:50:50 kg NPK ha^{-1} and 150:75:75 kg NPK ha^{-1}. Similar results were found by Dutta *et al*. (2005) and Shivani *et al*. (2003).

The data on post harvest yield attributes *viz.*, weight of panicle (g), weight of grains per panicle (g), test weight (g), indicated that effects of varieties in all these characters were significant and variety Lok-1 recorded significantly higher yield attributes than SKFPS-645 but it was at par with NIAW-34 (Jat and Singh, 2004 and Verma *et al*., 1997).

Grain and straw yield :

In case of grain yield and straw yield, application of 120:60:60 kg NPK ha^{-1}, recorded the highest grain (24.52 q/ ha) and straw (32.94 q/ha) yield than 80:40:40 kg NPK ha^{-1}, 100:50:50 kg NPK ha^{-1} and was at par with 150:75:75 kg NPK ha^{-1}.

Grain and straw yield were significantly influenced by different varieties. Variety Lok-1 produced significantly higher grain yield. (23.67 q ha^{-1}) over SKFPS-645 and it was at par with NIAW-34 . The straw yield was significantly influenced by varieties, Lok-1 produced significantly higher straw yield (31.12 q ha^{-1}) than SKFPS–645 and NIAW–34. Similar results were found by Kumpawat and Rathore (1995).

Harvest index :

The effect of fertilizer levels on harvest index was found to be significant and maximum harvest index recorded with application of 120:60:60 kg NPK ha^{-1} than 80:40:40, 100:50:50 kg NPK ha^{-1} but it was at par with 150:75:75 kg NPK ha^{-1}.

Among the varieties, Lok-1 recorded significantly higher harvest index than rest of the varieties.

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