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Performance of late sown wheat (*Triticum aestivum* L.) as influenced by different levels of fertilizers along with biofertilizers

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ABSTRACT : The field investigation was carriedout on performance of late sown wheat (*Triticum aestivum* L.) as influenced by different levels of fertilizers along with biofertilizers with the recommended cultural practices and plant protection measures. The application of 125 per cent RDF + *Azotobacter* + PSB (T_8) recorded significantly higher plant height, number of effective tillers per plant, panicle length, dry matter per plant, number of spikelets per panicle, number of grains per panicle, weight of grains per panicle, grain yield, straw yield and biological yield than all other treatments. It was followed by the application of 125 per cent RDF (T_4) and 100 per cent RDF + *Azotobacter* + PSB (T_7) treatments. Lowest plant height, number of effective tillers per plant, panicle length, dry matter per plant, number of spikelets per panicle, number of grains per panicle, weight of grains per panicle, grain yield, straw yield and biological yield was observed in 50 per cent RDF. Recommonded dose of fertilizer was 80:40:40 kg NPK ha^{-1}.

Key **W**ords : Wheat, Levels of chemical fertilizers, Type of biofertilizers, Productivity

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Wheat (*Triticum aestivum* L.) is an annual plant of family Gramineae family. Wheat compares well with other important cereals in its nutritive value. It contains 11-12 per cent proteins which is more than other cereals. Wheat is the world's leading cereal crop, cultivated over an area about 224 mha with a grain production of 683 mt (2008-2009). In Maharashtra area under wheat is 12.53 mha, production is 23.71 mt and productivity is 15.20 q/ha. (Anonymous, 2009).

Nitrogen fixing bacteria have been tried in cereal crop with considerable success. These micro-organisms serve as a viable alternative to nitrogenous fertilizers and involve comparatively less cost. However, the productivity of wheat under late sown condition can be increased through the application of suitable fertilizer level along with biofertilizers. The biofertilizers such as *Azatobacter* (*Azotobacter chrococum*) and PSB (*Pseudomonas striata*) are used as a seed inoculation for fixing the atmospheric nitrogen asymbiotically and phosphorus to become in available form, respectively.

RESEARCH PROCEDURE

An experiment was conducted during *Rabi* season of 2009-2010 in medium black soil at the experimental field, College of Agriculture, Ambajogai, district Beed. The experiment was laid out in a Randomized Block Design with eight treatment combinations, comprising of three replications in gross and net plot size of 4.6 × 3.6 m^2 and 3.6 × 3.24 m^2, respectively. Sowing was done on 11th Dec., 2009 with variety Trimbak (NIAW-301). The number of irrigations given for better crop growth was five during the course of experimentation.

RESEARCH ANALYSIS AND REASONING

The effects of treatments on wheat yield attributes and seed yield are presented in the Table 1.

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Table 1 : Growth sattributing characters as influenced by different treatments

Treatments	Plant height (cm)	Number of effective tillers/ plant	Panicle length (cm)	Dry matter / plant (g)	Number of spiklets/ panicle
T_1 - 50% RDF	52.83	1.67	6.60	2.16	34.33
T_2 - 75% RDF	56.20	1.87	7.00	2.59	38.33
T_3 - 100% RDF	59.37	2.07	7.30	2.80	41.67
T_4 - 125% RDF	62.30	2.43	7.90	3.34	45.67
T_5 - 50% RDF + *Azotobacter* + PSB	55.90	2.07	6.87	2.56	36.33
T_6 - 75% RDF + *Azotobacter* + PSB	59.43	2.27	7.20	2.99	39.67
T_7 - 100% RDF + *Azotobacter* + PSB	65.40	2.47	7.63	3.39	43.67
T_8 - 125% RDF + *Azotobacter* + PSB	69.53	2.87	8.23	4.07	49.00
S.E. ±	3.05	0.16	0.01	0.35	2.59
C.D. (P=0.05)	9.26	0.48	0.03	1.06	7.83
General mean	60.12	2.21	0.18	3.02	41.08

Table 2 : Yield attributing characters as influenced by different treatments

Treatments	Mean no. of grains / panicle	Wt. of grains / panicle	Test wt.	Grain yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)
T_1 - 50% RDF	23.20	0.94	39.99	13.11	15.16	28.27
T_2 - 75% RDF	26.07	1.12	42.10	16.59	21.46	38.06
T_3 - 100% RDF	28.40	1.33	45.57	20.86	28.51	49.37
T_4 - 125% RDF	35.50	1.56	47.40	24.36	34.09	58.45
T_5 - 50% RDF + *Azotobacter* + PSB	25.43	1.10	42.22	14.89	19.56	34.45
T_6 - 75% RDF + *Azotobacter* + PSB	28.03	1.28	44.30	19.23	26.43	45.66
T_7 - 100% RDF + *Azotobacter* + PSB	32.73	1.49	47.06	24.32	32.69	57.01
T_8 - 125% RDF + *Azotobacter* + PSB	35.60	1.79	49.23	27.88	38.21	66.09
S.E. ±	2.26	0.13	3.04	1.74	3.51	4.39
C.D. (P=0.05)	6.84	0.39	NS	5.28	10.64	13.33
General mean	29.00	1.33	44.73	20.16	27.01	47.18

NS = Non-significant

Growth and development :

The beneficial effect of different effective fertilizer levels along with biofertilizers on plant height, number of tillers per plant, panicle length, and dry matter per plant of wheat were evident during active growth and maturity.

The application of 125 per cent RDF + *Azotobacter* + PSB produced more vegetative growth in early period of crop growth. It was observed from the data that the height was found to be increased progressively at every stage of crop growth. The increase in height was rapid during 45-60 DAS and thereafter it increased marginally till maturity. The effect of different fertilizer levels along with biofertlizers on plant height was found to be significant at all stages of crop growth except at 30 DAS. The higher plant height was observed by the application of 125 per cent RDF + *Azotobacter* + PSB (69.53 cm) as compared to other treatments (Table 1). Similar result was obtained by Jakhar *et al.* (2005).

Data on mean number of effective tillers per plant revealed that these increased rapidly up to 60 days and moderately between 75 days and decreased thereafter towards maturity. The application of 125 per cent RDF + *Azotobacter* + PSB (2.87) followed by the application of 100 per cent RDF + *Azotobacter* + PSB (2.47) and 125 per cent RDF (2.43) recorded the highest number of branches at every stage of the crop growth. These findings were reported by Behera (1993) and Sharma *et al.* (2007).

The panicle initiation started at 55-60 days and progressively increased up to harvest of crop. The application of 125 per cent RDF + *Azotobacter* + PSB (8.23 cm) followed by the application of 125 per cent RDF (7.90 cm) and 100 per cent RDF + *Azotobacter* + PSB (7.63 cm) recorded the highest mean panicle length at every stage of the crop growth. Similar result was reported by Singh *et al.* (1993) and Jakhar *et al.* (2005).

Total dry matter accumulation per plant was found to be increased continuously with advancement in age of the crop till maturity. The rate of increase in dry matter accumulation was slow up to 60 days and faster at 75 days and at harvest it was slow down. The application of 125 per cent RDF + *Azotobacter* + PSB (4.07 g) followed by the application of 125 per cent RDF (3.34 g) and 100 per cent RDF + *Azotobacter* + PSB (3.39 g) recorded the highest dry matter accumulation at every stage of the crop growth. Similar result was reported by Singh *et al.* (1993).

Yield and yield attributes :

The mean number of spikelets per panicle and mean number of grains per panicle are presented in Table 1 and 2. The application of 125 per cent RDF + *Azotobacter* + PSB (49.00 and 35.60) followed by the application of 125 per cent RDF (45.67 and 35.50) and 100 per cent RDF + *Azotobacter* + PSB (43.67 and 32.73) recorded the highest number of spikelets per panicle and number of grains per panicle, respectively. Same result was reported by Behera (1993) and Singh *et al.* (2002).

The effect of different fertilizer levels along with biofertilizer on 1000 grain weight (test weight) was found to be non significant. But the highest test weight was observed by the application of 125 per cent RDF + *Azotobacter* + PSB (49.23 g). Similar result was reported by Parihar and Tiwari (2001).

Data on grain and straw yield kg ha^{-1} as influenced by different fertilizer levels along with biofertlizers was found to be significant. The application of 125 per cent RDF + *Azotobacter* + PSB (27.88 and 38.21) followed by the application of 125 per cent RDF (24.36 and 34.09) and 100 per cent RDF + *Azotobacter* + PSB (24.32 and 32.69) recorded the highest grain and straw yield, respectively. Same result was reported by Gupta *et al.* (2007).

Data on biological yield kg ha^{-1} as influenced by different fertilizer levels along with biofertlizers was found to be significant. The application of 125 per cent RDF + *Azotobacter* + PSB (66.09) followed by the application of 125 per cent RDF (58.45) and 100 per cent RDF + *Azotobacter* + PSB (57.01) recorded the highest biological yield.

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