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Effect of seeding method and fertilizer application on weed biomass and yield of wheat (*Triticum aestivum*)

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ABSTRACT

A field experiment was conducted on sandy loam soil analysing low in N and medium in P and K during *rabi* season of 1993-94 and 1994-95 at Varanasi to evaluate the effect of different methods of sowing and fertilizer application in wheat (*Triticum aestivum* L. emend. Fiori & Paol.). Line sowing and placement of fertilizer in rows 5 cm below the seed showed significant reduction in weed biomass and increased the yield of wheat over broadcast sowing and fertilizer application. Seed emergence was markedly reduced when fertilizer and seed were mixed and then sown in rows. The root weight of plants grown with broadcast sowing was lower than of row sown crop. The row sowing of seed and placement of fertilizer in rows or broadcast of fertilizer but sowing of seed in rows removed higher amount of N, P and K than broadcast of seed and fertilizers.

Key words: Wheat, Seeding method, Fertilizer, Weed biomass

Method of seeding and fertilizer application has certain impact on weed growth, seedling emergence and root development. Broadcast has become a common method of seeding and fertilizer application for growing wheat in eastern part of Uttar Pradesh due to lack of power driven ferti-cum seed drill and other such devices. There has been a tendency to broadcast or to sow seeds mixed with fertilizer or broadcast fertilizers but sowing of seed in rows. These practices hamper seed germination or survival of seedlings, consequently, yields are reduced. In broadcast sown crop, besides intraspecific competition, weed-crop competition for varions growth resources is also severe which ultimately leads to poor crop growth and yield. The information on quantification of seed emergence, weed biomass, root weight and yield as influenced by methods of seeding and fertilizer application is meagre, hence this investigation was made on wheat.

MATERIALS AND METHODS

The field experiment was conducted during *rabi* (winter) seasons of 1993-94 and 1994-95 at Varanasi on a sandy loam soil (Udic Ustochrept) with pH 7.7, organic carbon 0.42%, available N, P and K 197, 20 and 218 kg/ha, respectively. The experiment was laid out in randomized block design

with 4 replications having six treatments viz., broadcast of seed and fertilizer separately followed by mixing with plough (T_1), broadcast of seed and fertilizer mixed together followed by mixing with plough (T_2), broadcast of fertilizer followed by sowing of seed in rows (T_3), seed and fertilizer placed in rows simultaneously (T_4), fertilizer and seed mixed and then sown in rows (T_5) and placement of fertilizer in rows 5 cm below the seed (T_6). The N, P_2O_5 and K_2O were applied @ 120 : 60 : 60 kg/ha. Half of the N, total P and K were applied as basal at the time of sowing and remaining N was applied in two equal splits at tillering and boot leaf stages.

RESULTS AND DISCUSSION

Seed emergence

Placement of fertilizer in rows 5 cm below the seed recorded significantly higher seed emergence than other methods of seeding except broadcast of fertilizer followed by sowing of seed in rows in 1993-94 and placement of seed and fertilizer in rows simultaneously in 1994-95. The least emergence was noticed where fertilizer and seed were mixed and then sown in rows (Table 1). The placement of fertilizer in rows 5 cm below the seed recorded higher seed emergence because of availability of adequate moisture. The fertilizer application in rows showed marked influence on early seedling emergence without any injury. Higher degree of injury to seedlings might be the cause of poor emergence in seed sown mixed with the fertilizer. The severity of the injury depends on the soil moisture content at the seedling emergence and the type and rate of fertilizer application. These findings are in conformity with those of Rao *et al.* (1985).

Weed biomass

Broadcast method of fertilizer application and sowing (T_1 and T_2) produced more weed biomass (Table 1) than row placement of fertilizer (T_4 and T_6). Row sown crop significantly reduced the weed biomass. This may be attributed to limited space available to growing weeds in row placed fertilizer and seed and also lesser availability of applied nutrients in inter-row spaces and also the weeds are smothered in rows by the crop

Table 1. Effect of methods of fertilizer application and sowing on seed emergence, and dry weed biomass

Treatment	Seed emergence/(m²)		Weed biomass (q/ha)	
	1993-94	1994-95	1993-94	1994-95
T_1	319	322	2.12	2.00
T_2	312	319	2.43	2.12
T_3	339	342	2.05	1.98
T_4	332	349	1.72	1.62
T_5	275	261	2.58	2.43
T_6	345	356	1.31	1.39
CD (P = 0.05)	6.13	8.52	0.43	0.52

DAS = Days after sowing

plants. This showed favourable effect on yield attributes and finally on grain and straw yields. On the other hand, lower plant population and higher weed infestation together in broadcast sown crop resulted in lower yield. The results corroborate the findings of Jain *et al.* (1989), and Gogoi and Kalita (1995).

Dry weight of root

Placement of fertilizer in rows 5 cm below the seed, and seed and fertilizer placed in rows simultaneously recorded higher root weight than other seeding methods (Table 2). The higher root weight in the former was possibly due to better utilization of soil moisture and nutrients available close to roots of the crop. These findings are in close conformity with the earlier findings of Rathi and Singh (1973), who reported that drilling of nitrogen to a depth of 10 cm at sowing gave higher root weight of wheat than when nitrogen was broadcast on soil surface.

Grain and straw yields

Placement of fertilizer in rows 5 cm below the seed recorded higher grain and straw yields than other methods, except straw yield in 1993, where this treatment was at par with placement of seed and fertilizer in rows simultaneously and broadcast of seed and fertilizer mixed together. The superiority of this treatment could be attributed to the less weed biomass and easy availability of nutrients close to roots. In treatment, where fertilizer was mixed with seeds and then sown in rows, fertilizers like urea, and potassium chloride in direct contact with the seed might have caused injury to emerging seedlings, resulting in reduced plant population. Bishnoi *et al.* (1983) also observed that fertilizer placement below the seed gave significantly higher grain yield of wheat than broadcast method. The poor yield in broadcast method of fertilizer application and sowing (T_1 and T_2) possibly resulted owing to poor plant stand and utilization of nutrients.

Nutrient uptake

Placement of fertilizer in rows 5 cm below the seed recorded markedly higher uptake of N, P and K than other methods of seeding (Table 3). This might be due to

Table 2. Effect of methods of sowing and fertilizer application on dry weight of the root and yield of the wheat

Treatment	Dry root weight (50 DAS) (g/0.30 m^3)		Yield (q/ha)			
			Grain		Straw	
	1993-94	1994-95	1993-94	1994-95	1993-94	1994-95
T_1	8.12	8.74	40.21	38.75	61.21	59.27
T_2	8.23	8.19	39.16	38.56	62.50	59.74
T_3	10.96	9.86	41.95	42.33	61.72	60.24
T_4	11.75	11.21	42.17	43.43	62.82	59.60
T_5	9.56	9.86	38.12	36.15	60.17	59.17
T_6	12.29	11.92	44.98	45.98	63.14	62.14
CD (P = 0.05)	1.05	1.10	1.12	1.14	1.12	1.62

Table 3. N, P and K uptake (kg/ha) in wheat as influenced by different treatments

Treatment	N		P		K	
	1993-94	1994-95	1993-94	1994-95	1993-94	1994-95
T_1	94.21	90.68	36.18	36.34	127.67	118.50
T_2	91.98	90.56	38.15	36.70	127.34	119.33
T_3	99.19	101.92	39.70	40.75	130.96	127.65
T_4	102.30	102.87	39.95	39.28	132.04	134.47
T_5	89.28	86.14	35.40	35.26	120.76	127.83
T_6	106.12	107.76	45.56	44.84	137.04	145.10
CD (P = 0.05)	0.74	0.75	1.4	1.5	0.72	0.75

availability of nutrients in proximity of the root and prolonged period of availability to the crop. The uptake of N, P and K decreased considerably when fertilizer was mixed with the seed (T_5) probably because of chemical injury to the seed when weeds, fertilizer and moisture all act adversely. In broadcast method of fertilizer application, the root growth in sub surface is poor since nutrients like P remain on the surface, hence less uptake of nutrients due to diffusion and root interception. Barrow (1960) reported that drilled phosphate was about twice as effective as phosphate broadcast at sowing. Similar observations were also made by Rao *et al.* (1985).

REFERENCES

Barrow, N.J. 1960. A comparison of the mineralization of nitrogen and sulphur from decomposition of organic materials. *Australian Journal of Agricultural Research* **11** : 960-969.

Bishnoi, K.C., Nandal, D.P., Dhiman, S.D. and Sharma, H.C. 1983. Evaluation of methods and rates of fertilizer application in normal and late sown wheat. *Indian Journal of Agronomy* **28** : 112-114.

Gogoi, A.K. and Kalita, H. 1995. Effect of seeding method and herbicide on weed, and growth and yield of wheat (*Triticum aestivum*). *Indian Journal of Agronomy* **40** : 209-211.

Jain, N.K., Nigam, K.B., Jamley, N.R. and Khandkar, V.R. 1989. Effect of methods of sowing on yield of dwarf wheat. *Indian Journal of Agronomy* **34**, 106-107.

Rao, M.V., Reddy, B.B., Ghosh, B.C. and Panda, M.M. 1985. Effect of form, method and time of urea N application on growth, yield and N uptake. *Plant and Soil* **83** : 243-253.

Rathi, K.S. and Singh, R. 1973. Note on the effect of rates and methods of nitrogen on root development of wheat Kalyan sona under dry farming condition. *Indian Journal of Agricultural Research* **7** : 121-122.