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Short communication

Productivity and economics of late-sown wheat under different sowing methods and weed management practices

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Rice–wheat system is dominant cropping system of the Uttar Pradesh, which is widely practiced by the farmers. Late transplanting of rice, use of long-duration varieties and heavy rains during later phase of rice crop are the main reasons for delayed sowing of wheat. A rise in temperature during early spring inducing early maturity is also a key yield-reducing factor in late-sown wheat (Yasmeen *et al.* 2012). Several methods of weed control are being practiced by the farmers. The manual weeding besides being expensive and troublesome, cannot be practiced until weeds put forth sufficient vegetative growth. Adoption of suitable combination of sowing method and weed management practice can substantially contribute to reduce the weed density and increase the productivity of late-sown wheat.

A field experiment was conducted at Agronomy Research Farm of NDUA&T, Faizabad during *Rabi* 2008-09. The soil was silt loam in texture, low in organic C (0.32%), available N (160 kg/ha) and available P (19 kg/ha) and medium in available K (234 kg/ha) content. The experiment was layout in split-plot design and replicated three times. The main plots included three sowing methods, *viz.* line sowing, cross sowing, and broadcasting; and six weed management practices, *viz.* isoproturon 1.0 kg/ha + 2,4-D 500 g/ha, clodinafop 60 g/ha, metribuzin 200 g/ha, sulfosulfuron 25 g/ha, weedy check and weed-free check as subplot treatments. After the rice crop was har-vested, field was prepared by cultivator and planking, and 125 kg/ha seeds of variety *'UP 2425'* was sown in 20 December, 2008. Fertilizer (120 kg/ha N, 60 kg/ha P_2O_5, 40 kg/ha K_2O) was applied to the crop. A one-third dose of N and full dose of P and K was applied before sowing, and the re-maining N was top-dressed in two equal splits at the first node and booting stages.

Differences in growth and yield attributes were observed due to sowing methods and weed management practices (Table 1). The significantly higher plant height (77.5 cm), number of shoots/m^2 (376), dry matter accumulation (882.5 g/m^2), spike/m^2 (317), spike length (9.3 cm) and number of grains/spike (37.8) were recorded in cross sowing than broadcasting; however, these were was at par with line sowing. This might be due to optimum plant population and poor weed growth due to smothering effect. The significantly higher plant height (85.9 cm) was recorded in weed-free check than rest of the treatments; however, it was at par with isoproturon 1.0 kg/ha + 2,4-D 500 g/ha and metribuzin 200 g/ha in respect of number of shoots/m^2 and dry matter accumulation.. The more growth and yield attributes in weed-free check followed by isoproturon at 1.0 kg/ha + 2,4-D 500 g/ha was due to lower weed competition for water, sunlight and greater availability of nutrients, which resulted in profuse growth of plants and effective control of both grassy and broadleaved weeds (Tiwari *et al.* 2011).

Productivity in terms of grain and straw yield differed significantly due to different sowing methods and weed control treatments (Table 2). The maximum grain and straw yields of 3.8 and 5.5 t/ha, respectively, were recorded with cross sowing, which were significantly more than line sowing and broadcasting. The higher values of grain yield may be ascribed to marked decrease in weed population and weed dry weight, and thereby better growth and yield attributes. These results are in conformity with the findings of Saquib *et al.* (2012). Maximum net returns and B:C ratio were obtained in cross sowing followed by line sowing. Weed-free check recorded maximum net returns and B:C ratio, followed by isoproturon 1.0 kg/ha + 2,4-D 500 g/ha

SUMMARY

A field experiment was conducted during *Rabi* season of 2008-09 at Faizabad to study the effect of sowing methods and weed management practices on growth and productivity of wheat. Cross sowing recorded significantly higher growth, yield attributes in terms of plant height, number of shoots/m^2, dry matter accumulation, number of spike/m^2, spike length, number of grains/spike and grain (3.8 t/ha) and straw (5.5 t/ha) yields. The val-

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Table 1. Effect of sowing methods and weed management practices on growth and yield attributes of wheat

Treatment	Plant height (cm) at harvest	No. of shoots /m^2 at harvest	Dry matter accumulation (g/m^2)	No. of spike /m^2	Spike length (cm)	No. of grains /spike	1000-grain weight (g)
Sowing methods							
Line sowing	74.3	372	877.7	312	9.1	37.2	40.8
Cross sowing	77.5	376	882.5	317	9.3	37.8	41.0
Broadcasting	65.9	343	818.8	294	8.7	34.9	40.6
LSD (P=0.05)	3.2	16.1	36.3	11.4	0.4	1.64	NS
Weed management							
Isoproturon 1.0 kg/ha + 2,4-D @ 500 g/ha	79.2	382	903.9	332	9.4	39.8	41.2
Clodinafop 60 g/ha	64.3	360	822.6	292	8.7	32.3	40.6
Metribuzin 200 g/ha	73.4	366	878.3	312	9.1	38.0	41.0
Sulfosulfuron 25 g/ha	68.3	363	841.4	301	8.7	35.6	40.6
Weedy check	61.7	327	806.3	247	8.4	30.9	40.3
Weed free check	85.9	401	905.3	364	9.6	40.3	41.3
LSD (P=0.05)	5.0	25.1	59.1	21.0	0.6	2.4	NS

Table 2. Effect of sowing methods and weed management practices on yield and economics of wheat

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	Cost of cultivation (x10^3 `/ha)	Net returns (x10^3 `/ha)	B:C ratio
Sowing methods					
Line sowing	3.5	5.0	19.82	24.98	1.25
Cross sowing	3.8	5.5	20.14	28.09	1.39
Broadcasting	3.3	4.5	19.49	22.71	1.18
LSD (P=0.05)	0.17	0.23	-	-	-
Weed management					
Isoproturon 1.0 kg/ha + 2,4-D @ 500 g/ha	3.9	5.6	19.91	29.15	1.47
Clodinafop 60 g/ha	3.6	4.5	19.92	24.35	1.22
Metribuzin 200 g/ha	3.8	5.3	19.54	27.78	1.42
Sulfosulfuron 25 g/ha	3.7	5.0	19.84	25.13	1.27
Weedy check	2.5	3.9	19.05	13.35	0.69
Weed-free	4.1	6.1	20.64	31.80	1.58
LSD (P=0.05)	0.24	0.35			

ues of growth, yield attributes and grain (4.1 t/ha) and straw (6.1 t/ha) yields were higher in weed-free check. Application of isoproturon at 1.0 kg/ha + 2,4-D 500 g/ha was found best as compared to other herbicide treatments.

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