Short communication

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Time of nitrogen application and weed management practices for increased production of wheat in Gujarat

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Wheat *(Triticum aestivum L.)* is an important cereal crop for a large number of countries in the world. It provides about 20% of total food calories for the human diet. It can be grown on a variety of soils but clay loam soil is most suitable (Hossain *et al.* 2006). In India, wheat stands second next to rice in area and production, but first in productivity among all the cereals. In Gujarat, area under wheat is about 12.07 lakh ha with total production of 28.97 lakh t and productivity of 2.40 t/ha.

Nitrogen is the key element for plant growth and development, as it is a constituent of chlorophyll. Applying nitrogen fertilizer is must to enhance production specially in non-legume crops, buts nitrogen management is the key approach in improving quality and productivity of wheat. Therefore, optimum use of nitrogen throughout the crop period is of vital importance to exploit the production potential of crop. Weeds have naturally good competitive ability, use more water and nutrients as compared to the crop plants and hence, weed management plays a vital role in boosting up wheat production. Nitrogen fertilization enhanced the weed population and growth and weeds may reduce the nitrogen use efficiency by the crop, particularly during the critical period of crop-weed competition. The use of herbicides is effective, if used at recommended dose Therefore, a study was done to see the effect of nitrogen and herbicide to increae the yield potential at middle gujrat conditions.

A field experiment was conducted during *Rabi* season of the year 2011-12 at the College Agronomy Farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat). The treatments comprised combination of time of nitrogen application ($^1/_2$ as basal + $^1/_2$ at CRI; - $^1/_2$ as basal + $^1/_4$ at CRI + $^1/_4$ at FND; $^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND and weed management practices like pendimethalin 1 kg/ha (PE), metsulfuron-methyl 0.0004 kg/ha (PoE at 25-30 DAS), pendimethalin 1.0 kg/ha (PE) *fb* metsulfuron-methyl 0.0004 g/ha (PoE at 25-30 DAS), hand wedding at 20 and 40 DAS and weedy check. The experiment was laid out in a randomized block design (factorial) with fifteen treatment combinations replicated four times. Wheat vaiety '*GW-366*' was used in the experiment. Application of pendimethalin 1 kg/ha as pre sowing and metsulfuron-methyl 4 g/ha at 25 days after sowing was done as per treatment. Two hand weeding were carried out at 20 and 40 days after sowing as per treatment. The entire quantity of phosphorus (60 kg P_2O_5/ha) in the form of single super phosphate and nitrogen in the form of urea as per treatment were applied in opened furrows as basal application before sowing of wheat crop. The remaining half dose of nitrogen was top dressed at CRI and FND stage as per treatments. Remaining all agronomic practices were followed as per recommendations of the crop.

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Effect of nitrogen application

Application of nittrogen $^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND significantly recorded the highest grain yield (4,017 kg/ha) and straw yield (6,506 kg/ha, respectively) as compared to treatment $^1/_2$ as basal + $^1/_2$ at CRI. It might be due to the bold grains and vegetative growth resulted by application of nitrogen in split, which was reflected in higher grain and straw yields under this treatment. Similar results have been reported by Samra and Dhillon (2002).

Treatment $^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND minimized the monocot as well as dicot weed population and recorded significantly the lowest weed dry matter as compared to rest treatments at 25 and 50 DAS as well as at harvest (Table 1). Split application of nitrogen supply may have decreased N uptake of the weeds, which might have resulted in lower weed density and dry matter accumulation of weed species (Panwar *et al*. 1992).

Effect of weed management

Pendimethalin 1 kg/ha (PE) *fb* metsulfuron-methyl 0.004 kg/ha (PoE at 25-30 DAS) recorded sig-

Table 1. Effect of nitrogen and weed management practices on weed growth

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	Weed count no./m^2 (monocot)		Weed count no./m^2 (dicot)		Weed dry matter (g/m^2)		Weed control efficiency (%)		Weed index (%)
			25 DAS	50 DAS	25 DAS	50 DAS	25 DAS	50 DAS	25 DAS	50 DAS	
Time of nitrogen application (T)											
$^1/_2$ as basal + $^1/_2$ at CRI	3.48	4.96	8.77 (87.4)	7.97 (73.0)	15.5 (281)	14.1 (229)	6.55 (43.4)	7.16 (51.8)	-	-	-
$^1/_2$ as basal + $^1/_4$ at CRI + $^1/_4$ at FND	3.78	5.99	8.62 (85.9)	7.95 (72.1)	15.7 (288)	13.6 (223)	4.75 (22.9)	5.51 (30.9)	-	-	-
$^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND (T_3)	4.01	6.51	8.62 (84.4)	7.90 (70.6)	15.8 (292)	13.4 (218)	2.89 (9.3)	4.05 (17.5)	-	-	-
LSD (P = 0.05)	0.17	0.43	NS	NS	NS	NS	0.17	0.16	-	-	-
Weed management (W)											
Pendimethalin	3.78	5.96	9.74 (95.4)	9.91 (98.4)	17.7 (315)	17.1 (292)	4.53 (22.9)	5.76 (34.9)	31.4	23.5	2.61
Metsulfuron-methyl	3.85	6.02	10.6 (113)	8.62 (74.5)	19.7 (388)	15.1 (228)	5.42 (30.6)	5.51 (31.9)	5.41	30.1	0.70
Pendimethalin *fb* metsulfuron-methyl	3.88	6.20	9.91 (98.4)	8.26 (68.3)	17.5 (309)	14.3 (205)	4.37 (20.5)	5.25 (29.2)	36.55	35.9	-
Pendimethalin *fb* metsulfuron-methyl	3.74	5.59	2.36 (7.8)	2.32 (6.2)	2.82 (8.00)	2.48 (8.4)	3.93 (19.5)	4.74 (25.2)	39.64	44.8	3.61
Weedy check	3.54	5.32	10.7 (114)	10.6 (112)	20.5 (419)	19.5 (382)	5.40 (32.3)	6.60 (45.6)	0.00	0.00	8.72
LSD (P = 0.05)	0.22	0.55	0.48	0.44	0.46	0.75	0.22	0.20	-	-	-

CRI= Crown root initiation stage; FND : First node development

nificantly higher grain yield than treatment weedy check but was at par with metsulfuron-methyl 0.0004 kg/ha (PoE at 25-30 DAS), pendimethalin 1.0 kg and hand wedding at 20 and 40 DAS. Treatment was also significantly superior in straw yield than hand wedding at 20 and 40 DAS and weedy check.but was at par with treatments pendimethalin 1.0 kg/ha and metsulfuron-methyl 0.0004 kg/ha (PoE at 25-30 DAS), respectively (Table 1). Weeds removal at early stage in the season reduces crop-weed competition at the lowest possible limit and provided almost weed free environment, which was probably the reason for higher yield. Significantly, minimum yield was found with treatment weedy check than rest of the treatments. It may be due to higher infestation of weeds in the plots resulted in strong competition of weeds with crop for growth factors (moisture, light, nutrients and space). The present results were in close conformity with the findings of Sharma *et al*. (1999). Significantly minimum weed count (monocot and dicot), the lowest weed dry matter, maximum WCE and maximum weed index at 20 and 40 DAS as well as at harvest were noted under hand weeding at 25 and 50 DAS (Table 2). Early removal of weed reduced the infestation of monocot, dicot types of weeds and it also benefitted the plant growth. The results substantiated the reports of Kurchania *et al.* 2000.

Significantly minimum weed dry matter was found with treatment combination $^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND and hand wedding at 25 and 50 DAS as well as at harvest of the crop (Table 2).

Conclusion

Treatment of $^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND recorded maximum grain yield, straw, grain, lower weed count, weed dry matter, weed index, higher weed control .Ttreatmentpendimethalin 1.0 kg/ha (PE) *fb* metsulfuron-methyl 0.004 kg/ha (PoE at 25-30 DAS) (3.88 t/ha) recorded the higher grain yield, straw yield. While, Treatment *of h*and weeding at 20 and 40 DAS recorded significantly minimum count, weed dry matter, weed index with higher weed control efficiency. Interaction of nitrogen and weed management practices were significant in respect of plant height at harvest weed dry matter at 25, 50 and at harvest.

Table 2. Interaction effect of time of nitrogen application and weed management practices at 25, 50 and at harvest

Treatment	weed dry matter at 25 DAS (g/m^2)			weed dry matter at 50 DAS (g/m^2)			weed dry matter at at harvest (g/m^2)		
	T_1	T_2	T_3	T_1	T_2	T_3	T_1	T_2	T_3
W_1	6.33 (40.3)	4.61 (21.25)	2.66 (7.25)	7.19 (52.21)	5.75 (33.27)	4.35 (19.26)	14.39 (208.91)	9.96 (99.78)	7.53 (57.75)
W_2	6.79 (46.3)	5.31 (28.25)	4.15 (17.25)	6.94 (48.24)	5.48 (30.26)	4.10 (17.25)	13.87 (193.02)	9.49 (90.80)	7.11 (51.73)
W_3	5.72 (32.8)	4.50 (20.25)	2.90 (8.50)	6.64 (44.21)	5.39 (29.26)	3.71 (14.25)	13.28 (176.98)	9.33 (87.76)	6.43 (42.76)
W_4	6.26 (39.25)	4.15 (17.25)	1.37 (2.00)	6.64 (44.21)	4.66 (22.24)	2.91 (9.25)	12.05 (145.96)	4.00 (21.76)	1.57 (2.74)
W_5	7.63 (58.25)	5.20 (27.25)	3.35 (11.50)	8.37 (70.27)	6.25 (39.24)	5.17 (27.24)	16.73 (280.99)	10.83 (117.71)	8.96 (81.81)
LSD (P = 0.05)		0.19			0.35			0.86	

Figure in parenthesis indicate re-transformed value; All figures were subjected to transformed value (square root transformation); Tretment details of time of application (T_1, T_2, T_3) and weed managment (W_1 to W_5) as given in table 1

SUMMARY

A field experiment was conducted during the *Rabi* season of the year 2011-12 at Anand Agricultural University, Anand, Gujarat. The maximum grain yield, straw, grain, lower weed count , weed dry matter, weed index, higher weed control efficiency were obtained from treatment $^1/_3$ as basal + $^1/_3$ at CRI + $^1/_3$ at FND. Different weed management practices significantly influenced yields and weed parameters. The higher grain yield, straw yield were recorded from treatment pendimethalin 1.0kg/ha (PE) *fb* metsulfuron-methyl 0.004 kg/ha (PoE at 25-30 DAS) (3882 kg/ha). While, Treatment *of* hand weeding at 20 and 40 DAS recorded significantly minimum count, weed dry matter, weed index with higher weed control efficiency. The interaction effects time of nitrogen and weed management practices were significant in respect of plant height at harvest weed dry matter at 25, 50 and at harvest.

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