	S. Em.	C. D. @ 5% level
Varieties	± 0.38	1.48
Orders	± 0.47	—
Varieties × Orders	± 0.66	—
Orders within NPH-1	± 0.66	—
Orders within HC-6	± 0.66	—

The results show that there are no significant differences in the oil percentage of different order of spikes in both the varieties.

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Response of Unirrigated Wheat to Placement of Graded Levels of Nitrogen in *Tarai* Soils of U.P.

Tarai region of U. P., reclaimed from degraded forests, is characterised by organic matter rich, sandy loam to clay loam soils with water table at 1–7 ft depth. Wheat is the most important winter grain crop of this region. The present paper reports the response of N. P. 718 variety of wheat in this region to methods of application of N at different levels. Two field experiments, one each during 1963–64 and 1964–65 were conducted at Pant Nagar where the soil contained 2.21% organic matter and 0.12% N with pH of 6.8. Winter rainfall of the two seasons of experimentation was 21.8 mm and 69.0 mm respectively. The treatments consisted of three methods of application of N as ammonium sulphate (M_1 = broadcast just before sowing, M_2 = drilled 6.3 cm below the seed and M_3 = 5–7.5 cm on either side of the seed), three levels of N (N_1 = 33.6 kg, N_2 = 50.0 kg and N_3 67.2 kg N/ha), and one unfertilised control.

These 10 treatments were replicated four times in a randomised block design with gross plot size of 5.5 × 9.15 sq m. Wheat was sown in the second week of November each year. Seed was dro ped at 1 /ha in furrows one ed

side or behind this wheel hoe adjusted to drop the fertiliser at required depth. Irrigation was not given to wheat crop sown after a *Kharif* fallow each year.

Grain and stover yield data of wheat recorded for the two years are presented in Table 1.

TABLE 1. *Treatment effects on grain and straw yield of wheat (Var. NP 718) during two crop seasons*

Treatment Comparison		Grain yield (q/ha)		Straw yield (q/ha)	
		1963–64	1964–65	1963–64	1964–65
	N_1	6.96	16.49	18.40	45.47
	N_2	7.23	16.55	20.70	49.00
	N_3	8.17	16.59	21.59	44.72
S. Em. ±		0.44	00.74	00.81	02.44
LSD (at P=0.05)		N.S.	N.S.	N.S.	N.S.
	M_1	6.49	14.73	18.29	36.74
	M_2	7.65	17.69	21.62	49.50
	M_3	8.22	17.22	20.78	52.86
S. Em. ±		0.44	00.74*	00.81	2.44*
LSD (at P=0.05)		N.S.	02.14	N.S.	7.08
Treatment mean		7.46	16.54	20.22	46.36
Contral (N_0)		6.44	12.18	16.75	32.82
Control v/s Treat.		N.S.	(Significant)*	N.S.	(Significant)*
Interaction S.Em. ±		0.77	1.27	1.41	4.20
ESD		N.S.	N.S.	N.S.	N.S.
Grand Mean		7.36	16.11	19.81	45.01

Note: Pooled analysis was not done since error variances of individual years were heterogenous.

N.S. = Not significant

Better response of rainfed crops to nitrogen fertilisation during higher rainfall seasons is a well known fact. The present experiment also bears this out, since of the two seasons, wheat responded to nitrogen application only during the second one (1964–65) when winter rainfall was 69.0 mm as against 21.8 mm during 1963–64. During this second season too, though differences in stover and grain yields of fertilized and unfertilized crop were significant, yet the levels of N tried *i. e.* 33.6 kg/ha to 67.2 kg/ha did not differ amongst themselves. This shows that in spite of soils of the region being rich in N and organic matter, wheat did respond to N application under adequate winter rainfall but upto only a dose of 33.6 kg N/ha. At this dose, for each kg of N applied, an increase of 13.3 kg of wheat grain was recorded. Absence of response of wheat to higher doses of nitrogen could be due to either lack of further absorption or assimilation of the absorbed N by the plant under

When wheat responded to N during 1964–65 it responded to its methods of application too in respect of both grain and stover yield. Placement of N by either method *i. e.* below or side of the seed (M_2 & M_3) proved equally good and significantly superior to the broadcast application providing an increase of more than 3 q/ha of wheat grain over the latter. This clearly shows the low efficiency of the present method of surface application of ammonium sulphate on these rather calcium rich soils where, under unirrigated conditions, N could easily be subjected to volatilisation losses (Allison, 1966).

Moreover, under rainfed conditions since deeper soil layers always retain more moisture than upper ones, plant roots will have better opportunity of absorbing the added nutrients and for a longer duration too, when placed in this deeper moist soil zone by placement, in comparison to its surface application. But in view of the high water table of *Tarai* soils, too deep an application may not be needed; because in the present experiment placement of ammoninum sulphate 6.3 cm below the seed, which amounts to about 13.8 cm below the soil surface, proved as good as applying just at seed level *i. e.* at about 7 5 cm depth. Of these two methods, operationally, placement of fertiliser below the seed was much more practicable than its side band placement.

In view of the fact that *Tarai* region is privileged with higher frequency of adequate winter rainfall, placement of 33.6 kg N/ha below the wheat seed should prove useful.

From two seasons' field trials with rainfed wheat (*Var.* NP 718) conducted on *Tarai* soils of Pant Nagar, it was observed that surface application of N (as ammonium sulphate) was inefficient in boosting crop yield even when adequate winter rainfall was received. But placement of this fertiliser 6.3 cm below the seed at sowing to supply 33.6 kg N/ha proved a very effective practice in increasing grain and stover yield of this crop in wet winter season. In year of poor winter rain, however, wheat did not respond to even placement of this nutrient.

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