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Yield and Nitrogen Content of Wheat (*Triticum aestivum*) as Affected by FYM and Urea in Cold Arid Region of India

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A B S T R A C T

In the current study an experiment was carried out through the integrated use of organic manure (FYM) and inorganic fertilizers (Urea) on sandy loam soils of the cold arid region of India during 2015-2016. The incorporation of both organic manures and inorganic fertilizers met the total need of nitrogen in wheat i.e., 120kg/ha. The nutrient supply from both the sources was arranged in various combinations 0:0, 100:0, 25:75, 50:50, 75:25 and 0:100. Wheat variety HS-375 was taken in the experiment. The data on yield attributing characters yield and soil nutrient status were recorded. Nitrogen content of wheat grain was also analysed. The result was maximum in the combination having urea and FYM in the ration of 75:25, followed by treatment procuring nitrogen frm two sources in the ratio of 50:50. In grain, nitrogen content was highest in treatment receiving nitrogen 100% from urea followed by applying 100% FYM. After the crop harvest, the residual soil organic fertility was proportional to ratio of FYM used. The data in the study represented a conclusion that integrated farming using FYM and urea in the combination of 75:25 and 50:50 produced maximum yield.

Introduction

Wheat in one of the most important crop of India and it has been grown in every state. Wheat is an exhaustive crop and requires large amount of nutrients, so the use of chemical can't be completely avoided. The most fascinating thing about chemical fertilizers is that it is readily available and crop response is very high, but its continuous use meteorite soil health. On the agriculture sector there has been an immersed pressure to produce more food and fodder. In the cold arid region as the environmental conditions are not so favourable there has been a tremendous pressure on soil health (Sharma *et al.*, 2006). Soils in the cold arid region have different types and perform differently as they have coarse texture, low nutrient availability, low nutrient and water holding capacity. The crop growth and yield is extremely uneven. Boosting the crop production without

fertilizers is not possible and in the present day scenario growing of a wheat crop without these fertilizers is rater a miracle. In the cold arid region (Ladakh) of India, the cost of chemical fertilizers is higher and easily not available and these alone cannot meet the needs of productivity. Organic source with inorganic sources are more suitable. This integration not only reduced the cost of cultivation but also is an environment friendly approach. Incorporation of organic manures alone or in combination with inorganic fertilizers maintained soil fertility and proper nutrition to crop. The efficiency of chemical fertilizers was measured by their application with organic manures (Hussain *et al.,* 1988)

In this way an experiment was conducted to evaluate the integrated use of urea and FYM on nitrogen content and yield of wheat in cold arid region (Leh, Ladakh) of India.

Materials and Methods

A field experiment was conducted at Research Farm of Krishi Vigyan Kendra, Leh, Ladakh, SKUAST-K during 2015 and 2016 to evaluate the effect of integrated use of urea and FYM on nitrogen content and crop yield of wheat. FYM and urea were applied to supply 120kg/ha of nitrogen in different ratios *i.e.*, 0:0 (T_0), 100:0 (T_1), 25:75 (T_2), 50:50 (T_3), 75:25 (T_4), and 0:100 (T_5). The treatments were organised in randomized complete block design with four replications. Well rotten FYM was obtained from kvk-leh Dairy unit and analysed for total nitrogen.

The field was thoroughly prepared. According to the experimental plan, a layout was carried out with plot size of 4x4 m^2. In relevant treatment plots FYM and urea were uniformly distributed in appropriate ratio and were thoroughly mixed with the soil. In the treatments where nitrogen demand was below 60kg/ha from urea, all the urea was applied at sowing, while in other treatments which required nitrogen above 60kg/ha from urea, then the urea was applied in split dosed. One half at sowing and other half at second irrigation. The phosphorus @ 90kg/ha and potassium @ 60kg/ha were also applied as basal dose. Wheat was sown in rows with proper distance after seed bed preparation and fertilizer application and interculture operations were done properly.

Soil and plant analysis

The organic carbon was determined by rapid titration method given by Walkley and Black (1934). Kjeldhal method of Bremner and Mulvaney (1982), was used for determination of total nitrogen in wheat grains. Subbiah and Asija (1956) alkaline permanganate method was used for determination of mineral nitrogen (NH_4-N and NO_3-N). Soil pH was determined by using digital pH meter having ratio of soil and water (1:2.5) given by Jackson (1973).

Results and Discussion

The results determined that all the fertilizers significantly ($P<0.05$) enhanced the yield attributing characters and the yield of wheat as compared to that of control treatment (Table 1). The plant height was also significantly ($P<0.05$) greater in fertilizer treatment than that of control. The maximum plant height of 84.75 cm was recorded in the treatment obtaining nitrogen from FYM and urea in the ratio of 75:25 followed by 50:50 and 100:00 ratio. The control treatment receiving no FYM and urea has minimum plant height of 73.6 cm. significantly in integrated fertilized treatment, the maximum grain yield of wheat 34.70 q/ha was recorded in treatment obtaining nitrogen from FYM and urea in 75:25 ratio succeeded by 33.92 q/ha in treatment obtaining nitrogen from two sources in 50:50 ratio. A significant lowest grain yield

was recorded in treatment receiving nitrogen solely from FYM than other fertilizes treatments. Rathore *et al.,* (1995), Dudhat *et al.,* (1996), Vyas *et al.,* (1997) and Kumar and Singh (1997) recorded similar observations of obtaining higher yield of wheat grain with the combined application of FYM and inorganic fertilizers.

Similarly, the straw yield of wheat was significantly maximum in treatments obtaining nitrogen from FYM and urea in ratio 75:25 followed by the treatment ratios of 50:50and 100:0. The minimum straw yield was recorded in the control treatment followed by treatment receiving 100% nitrogen from FYM. The results in this experiment showed that the combination of the organic and inorganic sources resulted in higher yield of straw and the better straw yield in the treatment receiving more than 50% nitrogen from urea. The maximum straw yield was in the treatments receiving 100% nitrogen from urea.

Urea was considered as rapid and more influential source of nitrogen than FYM fir increasing growth of wheat but the combination of two sources in the ratio of 75:25 and 50:50 was found more effective. By the application of FYM and urea, there has not only increase in yield and yield attributing characters but also it enhanced soil physical condition and soil fertility for better wheat crop growth (Azad *et al.,* 1998; Sushila and Giri, 2000).

Nitrogen content in grain

There has been a variable response of different fertilizers on nitrogen content in wheat as reported in table 1. The maximum nitrogen concentration of 1.50% was obtained in treatment procuring 100% nitrogen from FYM, followed by treatment receiving 100% nitrogen from urea (1.46%). These results are coinciding results of Vyas *et al.,* (1997) who also recorded that incorporation of FYM notably enhanced nitrogen uptake in grains and straw of wheat. There has been a significant improvement in grain and straw yield also due to application of phosphorus and potassium.

Table.1 Plant height, grain and straw yield and nitrogen content of wheat as affected by integrated use of urea and farm yard manure

	Treatment		Plant Height (cm)	Grain Yield	Straw Yield	Nitrogen content in grain (%)
	% N from Urea	% N from FYM		(kg/ha)		
T_0	0	0	73.6	29.62	54.65	1.29
T_1	100	0	78.73	32.12	61.06	1.46
T_2	25	75	76.25	31.28	58.21	1.42
T_3	50	50	81.53	33.92	63.54	1.37
T_4	75	25	84.75	34.7	64.87	1.34
T_5	0	100	74.98	30.82	56.86	1.5
CD			14.8	7.27	8.64	3.81

Table.2 Effect of integrated use of urea and farm yard manure on soil nutrient status in wheat

	Treatment		pH (1:2.5)	OC (%)	N	P	K
	% N from Urea	% N from FYM			(kg/ha)		
T_0	0	0	8.1	0.35	305.68	8.1	305.13
T_1	100	0	7.9	0.4	334.32	9.58	341.29
T_2	25	75	8.2	0.56	403.23	17.65	391.1
T_3	50	50	7.8	0.51	383.21	15.84	372.66
T_4	75	25	8.5	0.48	369.84	11.21	350.02
T_5	0	100	8.6	0.68	442.54	19.24	402.36
CD			0.33	0.12	43.3	5.8	38.4

Soil fertility at harvest stage

After the harvest, the soil analysis shows higher nutrient status of organic carbon, available N, P and K in the fertilized treatments than in control. the maximum mineral nutrients in soil (available N) of 442.54 kg/hs was obtained in treatment receiving 100% nitrogen from FYM followed by 403.25 kg/ha in treatment receiving 75% nitrogen from FYM and 25% from urea. The control was having the lowest available phosphorus and potassium followed by treatment receiving nitrogen 75% from FYM and 25% from urea was having available phosphorus and potassium in range of 17.65 and 391.10 kg/ha. The treatment receiving 100% nitrogen from FYM was having the highest available P and K in the range of 19.24 and 402.36 kg/ha (Table 2).

The organic matter of soil was highest in that treatment which received 100% nitrogen from FYM followed by the treatment receiving nitrogen from 75% FYM and 25% urea. These were at par with the organic matter content of control.

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