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Effect of FYM and sand application on barley (*Hordeum vulgare*) under barley – fallow cropping system in the cold desert region of Himachal Pradesh

Rameshwar, Vishal Dogra*, G.D Sharma and Surinder Rana****
Department of Agroforestry and Environment
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062.

Abstract

The results of two years field experiment conducted at Research Sub Station, Lari of Himachal Pradesh Krishi Vishvavidyalaya situated in Spiti valley on silty loam soil, low to medium in fertility, showed that the application of farmyard manure or sand alone or in combination increased the grain and straw yields of barley and treatment combination of sand @ 25 t/ha along with incorporation of farmyard manure @10t/ha was found best, increasing yield by 157.3 per cent over control which was at par with the yield obtained with the application of sand @25t/ha and FYM mulching @20t/ha.

Introduction

Barley (*Hordeum vulgare*) is an important crop in the world agriculture and it occupies fourth position in the world acreage and third in total cereal production. On the national consumption pattern, 80% of total produce is utilized as non-alcoholic human foods and 10% each for animal feed and industrial raw material for the manufacture of alcoholic beverages such as beer, whiskey and other non-alcoholic malted food products for children, old and patients suffering from fever and other stomach ailments (Ram, 1983). In Himachal Pradesh, barley is the second major *rabi* cereal after wheat. In cold desert area of HP, barley is the principal cereal crop, which is consumed mainly as human food in the form of Sattu, parched grains and chapatis. About 35% of the total production is used for the preparation of local beverages, traditionally known as Lugari or Chhang, Sing-sing or Tee-kesh and rest, for the live-stock (Sethi and Singh 1983). Barley- fallow is the important cereal based cropping system prevailing in the dry Temperate Zone of Himachal Pradesh. Generally this cropping system yields very low due to high pH, and fluctuating temperature coupled with high velocity desiccating winds and high content of silt in the soil which acts as cementing agent due to frequent irrigation in the crop, forming a hard crust of soil. Various workers in different crops under similar conditions have advocated application of sand and farmyard manure. Therefore, the present study was undertaken to work out the appropriate application of sand with or without farmyard manure to alleviate the yield level in this cropping system in the Spiti Valley.

Material and Methods

A study was conducted at the Research Sub Station, Lari of Himachal Pradesh Krishi Vishvavidyalaya Palampur, situated in the Spiti Valley at a height of 3050 m above mean sea level in summer seasons of year 1998 and 1999. This area represents a typical cold desert dry temperate zone of Himachal Pradesh. The experiment was conducted in randomized block design replicated four times. The soil of the experimental site was silty loam in texture with gravel and shallow base, loose strata prone to erosion. Day temperature during summer rises up to 30-35 °C and a rise or fall in either way up to 23.4° C with in 24 hours has been recorded. Severe wind movement in this region needs a reference. Average rainfall recorded was 20cm per annum. The soil of the experimental site was alkaline in reaction (pH=8.3), low in available Nitrogen (225.6kg/ha) and Organic carbon (0.62), where as medium and high in P (18.5 Kg/ha) and K (320 Kg/ha) respectively. There were five treatments *viz.* organic manuring with FYM @ 20 t/ha as soil incorporation, sand application @ 50 t/ha alone, sand application @ 25 t/ha along with FYM incorporation @ 10 t/ha, farmyard manure mulching @ 20 t/ha + sand @ 25t/ha and control. The

*Krishi Vigyan Kendra, Kangra (H.P.) **Department of Agronomy, CSK HPKV, Palampur- 176062.

sand as per the treatment was applied only at the start of the experiment. In all the treatments including control, recommended dose of NPK was applied. The whole quantity of P_2O_5 and K_2O was applied as basal dose through single super phosphate and muriate of potash, respectively. The half dose of nitrogen was applied at sowing and the remaining half was applied at tillering stage through urea. The crop was fertilized with the recommended dose of 40:25:15 N, P_2O_5 and K_2O respectively. The 'Dolma' (hullless) variety of barley was sown at 15cm line to line distancet on 27th and 24th May during the years 1998 and 1999 respectively.

Results and Discussion

The results obtained on the yield attributes showed that the application of sand @25 t/ha along with FYM incorporation @10 t/ha resulted in significantly higher (pooled) number of ears/m^2, number of grains/ear and 1000 grain weight over all other treatments (Table 1). However, the application of sand along with FYM mulching @ 20 t/ha produced statistically similar number of ears/m^2 and 1000 - grain weight. The results further indicated that the incorporation of FYM @ 20 t/ha or sand @ 50 t/ha also increased number of ears/m^2 and 1000 - grain weight significantly over control during both the years of experimentation. The increase in the different yield contributing characters also reflected on the grain and straw yield of barley. Increase in grain yield of barley has also been recorded with the application of FYM as mulch @ 20 t/ha as reported by Dixit (1998) under dry temperate high hills of Himachal Pradesh. Significantly higher grain and straw yields were recorded, in the treatment of sand @ 25 t/ha along with the incorporation of farmyard manure @ 10 t/ha. This treatment remaining at par with application of sand @ 25 t/ha in conjunction with FYM mulching @ 20 t/ha out yielded all the other treatments under study during both the years of experimentation. These findings are in close conformity with the results obtained by Mathur and Mathur (1983) where they found that the yields of seed cotton and hybrid sorghum grown on saline soil were increased by sand application in Rajasthan (India), due to leaching of salts from the top soil profile owing to increased

Table 1. Effect of FYM and sand application on the yield attributes of barley

Treatment	No. of ears/m^2			No. of grains/ear			1000 grain weight (g)		
	1998	1999	Pooled	1998	1999	Pooled	1998	1999	Pooled
FYM incorporation 20 t/ha	327.1	339.5	333.3	42.5	45.1	43.8	30.2	30.5	30.4
Sand application 50 t/ha	340.9	344.9	342.9	43.9	46.6	45.3	30.2	30.8	30.5
FYM incorporation 10 t/ha + Sand 25 t/ha	397.6	388.4	393.0	48.1	48.5	48.3	32.2	31.9	32.0
FYM mulching 20 t/ha + Sand 25 t/ha	385.0	385.0	384.0	46.3	46.0	46.1	31.0	31.8	31.4
Control	253.8	303.5	278.7	41.9	42.2	42.0	29.8	30.1	29.9
CD (P=0.05)	15.53	13.40	14.20	1.38	3.08	2.08	0.96	1.73	1.26

infiltration and reduced evaporation. The pooled yield data over two years (Table 2) showed that the application of FYM @ 20 t/ha and sand application @ 50 t/ha produced 25.6 and 64.7 per cent higher grain yield respectively over control. Vagrintseva *et.al.* (1996) from their study on the application of FYM to Barley also recorded 32-55% increase in grain yield with the different doses of FYM application and it was concluded that application of FYM up to 40 t/ha was sufficient for maintaining a positive humus balance. In the present study the combined application of 10 t farmyard manure and 25 t sand per hectare resulted in 157.3 per cent increase in grain yield of barley over control which may be attributed to the leaching of salts from soil profile owing to increased infiltration and reduced evaporation and better soil conditions w.r.t texture. Thus, the combined application of sand and farmyard manure might have improved the soil conditions, which has reflected in the form of favourable yield contributing characters and in turn increased grain and straw yield.

Table 2. Effect of FYM and sand application on the grain and straw yield of barley

Treatment	Grain Yield (q/ha)				Straw Yield (q/ha)			
	1998	1999	Pooled	Increase over control (%)	1998	1999	Pooled	Increase over control (%)
FYM incorporation 20 t/ha	12.05	15.18	13.62	25.6	17.34	20.84	19.09	16.1
Sand application 50 t/ha	17.50	18.20	17.85	64.7	31.04	33.04	32.04	94.8
FYM incorporation 10 t/ha + Sand 25 t/ha	28.66	27.11	27.89	157.3	37.09	35.90	36.50	121.9
FYM mulching 20 t/ha + Sand 25 t/ha	26.29	25.95	26.12	141.0	29.84	33.19	31.52	91.6
Control	9.34	12.34	10.84	-	14.88	18.02	16.45	-
CD (P=0.05)	3.04	2.85	2.69	-	3.14	4.78	2.62	-

VIR SOFTECH

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