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Effect of Mulching Materials and Number of Irrigations on Growth and Yield of Barley (*Hordeum vulgare L.*)

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Abstract **– The trial was conducted to evaluation the effect of effect of different mulching materials with frequency of irrigations in barley crop under semi-arid conditions, field experiments was carried out in 2018-19 growing season. Experimental units were arranged in *Factorial Randomized Block Design* (RBD) with three replications. It is evident from several studies that mulching has double actions: controlling weeds and providing soil cover, both of which reduce water loss through reduced transpiration and evaporation and increased availability of soil moisture content cause better growth of plants. Highest growth parameter were measured with application of pulse straw mulch material, similarly all the yield attributes viz. number of effective tillers, ear length (cm), weight of ears (g), number of fertile and sterile spikelets were found more over wheat and saw mulching. Number of irrigation also influenced the growth, yield attributes and yield parameters up to significant level and found more value with application of total three irrigations one at pre sowing and two at stand crop.**

Keywords **– Barley, Mulching, Irrigation, Growth, Yield and Economic.**

I. INTRODUCTION

Barley (*Hordeum vulgare L.)* is one of the most important cereal crop in the world. It is one of earliest cultivated crop since the time immemorial. It can be explained by the use of Barley in religious acts of Hindus. Barley is known as 'Jau' in Hindi language and it is mentioned as 'Yav' in Sanskrit. Barley grain contains 74% carbohydrate, 11.5% protein, 1.13% fat, 3.9% crude fibre, 1.5% Ash and 1.2% minerals. Barley is major source of food for most of the people of cool and semi-arid regions. Grains of barley are mostly used for manufacturing malt. It is consumed by making chapati or as parched grains to make 'sattu'. Barley is an easily digestible food grain due to presence of 'gluten' and it also consumed as a fermented drink 'Lugri'. Hulled type Barley is used by malting industry. Generally Barley has a cooling effect on body and in olden days 'sattu' was preferred to eat during summer. Barley water is found beneficial for those diarrhea and dysentery patients. In India barley is mostly used as animal feed and poultry feed it can also be used for fodder purpose due to its rapidly growing nature. Barley has a share of 7% global cereal production and it is third important cereal after Rice and Wheat. Barley is cultivated on nearly 51.5 million hectare area worldwide with a production of 142.01 million tonnes. During 2016-17 Barley occupied nearly 7.72 lakh hectare area in India having a production of 17.26 lakh tonnes grain with a productivity of 2522 kg/ha (Agricultural statistics 2017-18).

The average productivity of barley is very low in comparison to the attainable yield of 40-50q/ha. In recent years, the area occupied by barley tend to decrease, caused by a series of economic, climatic and other factors. In this situation, the production and productivity both have to be increase by adopting suitable agro-techniques to augment our domestic need and national economy. Bundelkhand region is the main barley growing tract of U.P. It is grown in all district of Bundelkhand under rainfed and moderate irrigated conditions. The 75% area of the region is unirrigated therefore, crop grown by moisture conservation practices is beneficial practice for barl-

-ey cultivation.

II. Materials and Method

The experiment was conducted at the Brahmanand Mahavidyalaya, Agricultural Research Farm, Post-Rath, District Hamirpur, Uttar Pradesh (India) during the winter (rabi) season of 2018-19. The soil of experimental field was 'parwa' (A category of red soil) with slightly alkaline in reaction (pH 7.6) which was low in available nitrogen (200.83 N_2O kg ha^{-1}), medium in available phosphorus (29.28 P_2O_5 kg ha^{-1}) and high in available potassium (474.16 K_2O kg ha^{-1}) and ranging 0.56% organic carbon content (Jackson, 1973). The trial was laid out in factorial randomized block design with three replications having 16 treatment combinations of four mulching material i.e. control, saw dust mulch @ 5 t/ha, wheat straw mulch @ 5 t/ha and pulse straw mulch @ 5 t/ha and four irrigation levels i.e. control, pre sowing irrigation, pre sowing irrigation + one irrigation and pre sowing irrigation + two irrigation. Nitrogen, phosphorus and Potassium were applied by urea, Di-Ammonium Phosphate and Muriate of Potash @ 60, 30 and 20 kg/ha. The half dose of Urea and full dose of DAP and MOP were applied at the time of sowing in furrows as basal dose and remaining half dose of nitrogen was applied after first irrigation. Barley variety Prakhar was used @ 100 kg/ha and it was treated with Agrosan GN @2.5g/Kg of seed 10 hours before sowing in field.

III. Results and Discussion

Table 1. Growth characters influenced by treatment.

Treatment	Height of Plant (cm) at 90 DAS	Fresh Weight/ Plant (g) at 90 DAS	Dry Weight/ Plant at 90 DAS	Number of Functional Tillers
Mulching materials				
M_0	77.23	35.83	9.43	4.07
M_1	78.70	36.67	10.05	4.30
M_2	80.02	37.68	10.68	4.61
M_3	81.66	38.17	10.92	4.93
S.E.(m) ± =	0.837	0.134	0.117	0.069
C.D.@5% =	2.42	0.39	0.34	0.20
Number of irrigations				
I_0	68.44	33.50	8.25	4.11
I_1	76.88	35.91	9.18	4.41
I_2	83.01	38.35	10.98	4.56
I_3	89.28	40.58	12.56	4.71
S.E. (m) ± =	0.837	0.134	0.117	0.069
C.D. @5% =	2.42	0.39	0.34	0.20

Data given in table 1 indicated that growth characters plant height (cm) was measured non-significantly higher with pulse straw mulching over others mulching sources i.e. wheat straw and saw dust mulching material, while, fresh and dry weight per plant (g) at 90 DAS and number of functional tillers per plant were recorded

maximum to pulse straw mulching material followed by wheat straw mulch and saw dust mulching materials which was significantly more that wheat straw and saw dust mulching materials. Wheat straw and saw dust mulching materials were recorded significantly more over control. The growth characters were found to increase with different mulching materials over control plot. It is evident from several studies that mulching has double actions: controlling weeds and providing soil cover, both of which reduce water loss through reduced transpiration and evaporation and increased availability of soil moisture content cause better growth of plants. The similar results were given by Ahmed et al (2007) and Towa et al (2013).

Reference to table 1 indicate that growth characters viz. plant height (cm), Fresh and Dry weight (g) and number of tillers were recorded significantly maximum to pre-sowing+2 irrigation followed by sowing+1 irrigation**,** pre-sowing irrigation and control. Each level of increased number of irrigation was increased significantly increase growth parameters of barley crop. Among the various production inputs, water is the most crucial in agriculture since water is directly or indirectly involved in various metabolic activities of plants. Availability of sufficient amount of soil moisture causes better growth of plant. The similar results have been shown by Brahma et al (2007).

Table 2. Yield attributes and yield influenced by treatment.

Treatment	Length of Ear (cm)	Number of Grains/Ear	Straw Yield (q/ha)	Grain Yield (q/ha)
Mulching materials				
M_o	8.91	32.30	51.07	31.33
M_1	9.21	32.50	53.41	33.24
M_2	9.45	32.85	55.90	34.73
M_3	9.75	33.10	57.85	36.16
S.E.(m) ± =	0.206	0.063	0.890	0.535
C.D.@5% =	0.59	0.18	2.57	1.55
Number of irrigations				
I_0	8.43	27.95	40.22	24.03
I_1	9.30	31.65	50.08	30.59
I_2	9.70	34.00	59.24	36.89
I_3	9.89	37.15	68.69	43.95
S.E.(m) ± =	0.206	0.063	0.890	0.535
C.D.@5% =	0.59	0.18	2.57	1.55

Reference to table 2 indicate that length of ear (cm) number of grains per ear, grain yield (q ha^{-1}) and straw yield (q ha^{-1}) were recorded maximum with pulse straw followed by wheat straw, saw dust and control mulching materials. This is due to the fact that mulch increase the soil moisture and also reduce the competition for various component due to weeds. Mulch increase nutrient availability in root zone of plants, thus causing increase in yield attributes and hence in yield. The similar results were shown by Sarkar et al (2007), Rajput et al (2014).

Reference to table 2 indicate that number of length of ear (cm), number of grains per ear, grain yield (q ha^{-1}) and straw yield (q ha^{-1}) were recorded significantly maximum with pre-sowing+2 irrigation followed by sowing+1 irrigation**,** pre-sowing irrigation and control. The yield attributes were increased due to proper availability of soil moisture at critical stages of the crop causing better growth. The increase in yield was the final results of growth of plants and yield attributes. The similar findings have reported by Ram et al (2013) and Shaifi et al (2014).

IV. CONCLUSION

On the basis of the experiment following main conclusion the conclusion can be drawn that the pulse straw mulching with pre sowing irrigation followed by two irrigations is most suitable for Barley crop under existing condition of Bundelkhand region in Uttar Pradesh.

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