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Research Article

EFFECT OF TILLAGE PRACTICES ON GROWTH, YIELD ATTRIBUTES AND YIELD PERFORMANCE OF BARLEY VARIETIES (*Hordeum vulgare* L.)

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Abstract: The field experiment was conducted during *rabi* season of 2017-18 at Genetics and Plant Breeding Research Area of CCS Haryana Agricultural University, Hisar, which is located at 29°09'N latitude and 75°46'E longitude in western Haryana with an elevation of 215 m above mean sea level. The experiment was laid out in split plot design with three replications containing three tillage practices *viz*. conventional tillage, zero tillage and zero tillage + residue @ 6 ton/ha (pearlmillet straw) as main plot treatments and five barley varieties *viz*. BH 902, BH 946, RD 2552, DWRB 101 and DWRUB 52 as sub plot treatments. The different tillage practices failed to produce significant variation on plant height, dry matter accumulation and tillers irrespective of growth stages of barley. Two rowed barley varieties (DWRB 101 and DWRUB 52) have higher number of tillers as compared to six rowed barley varieties. The different tillage practices failed to produce significant variation on yield attributes *i.e.* spike number, spike length, grains per spike and 1000 grain weight of barley. BH 946 being at par with RD 2552 produced significantly higher grain yield than BH 902, DWRB 101 and DWRUB 52.

Keywords: *Barley, Tillage practice, Genotypes*

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Introduction

Barley (*Hordeum vulgare* L.) is one of the first domesticated plant species in the world. With a share of 7 percent of the global cereal production barley is considered fourth largest cereal crop in the world [1]. It has been traditionally considered as poor man's crop because it is one of the most input efficient crops and can be cultivated in adverse climatic conditions like drought, salinity, alkalinity and marginal lands etc. Barley can be an option, both for grain as well as fodder. However, its industrial demand as raw material has also increased. Barley is grown throughout the world resulting in a total production of 142.37 million metric tons [2]. In Haryana, barley is grown over an area of 41,000 hectare with a production of 0.14 million tons and productivity of 3420 kg/ha [3]. Barley grain contains approximately 12.5 percent moisture, 11.5 percent albuminoids, 74 percent carbohydrates, 1.3 percent fats, 3.9 percent crude fibre and 1.5 percent ash [4]. Conventional agriculture, based on intensive tillage and being highly mechanized, has been accused of being responsible for soil erosion problems, organic matter decline, surface and underground water pollution and more water consumption. Sowing of zero-till (ZT) wheat in the rice-wheat system of the Indo-Gangetic plains has been adopted by the farmers. There is a paradigm shift from intensive tillage to reduced/zero-tillage operations. Various tillage systems failed to produce significant variations on germination of wheat [5]. Significantly higher plant height was recorded under no-tillage (NT) as compared to conventional tillage (CT). Conventionally tilled crop resulted in taller plants and accumulated higher dry matter, which was statistically at par with zero-tilled but significantly higher than bed planted [6]. Crop yield is also affected by improper selection of varieties because performance of varieties varies correspondingly with their genetic potential and existing environment, so there is scope for increasing crop yield with cultivation of multi-character high yielding varieties [7]. Keeping the above facts in consideration, the experiment was conducted in *rabi* season of 2017-18 to study the effect of tillage practices and genotypes on growth yield attributes and yield performance of barley (*Hordeum vulgare* L.).

Material and Methods

The field experiment was conducted during *rabi* season of 2017-18 at Genetics and Plant Breeding Research Area of CCS Haryana Agricultural University, Hisar, which is located at 29°09'N latitude and 75°46'E longitude in western Haryana with an elevation of 215 m above mean sea level. The experiment was laid out in split plot design with three replications containing three tillage practices *viz*. conventional tillage, zero tillage and zero tillage + residue @ 6 ton/ha (pearlmillet straw) as main plot treatments and five barley varieties *viz*. BH 902, BH 946, RD 2552, DWRB 101 and DWRUB 52 as sub plot treatments. The soil of the experimental field was sandy loam in texture having pH 7.7, low in organic carbon (0.39%) and 128 kg ha-1, 15.5 kg ha-1 and 313 kg ha-1 nitrogen, phosphorus and potassium, respectively. For conventional tillage, field was prepared on 21st November, 2017 by two ploughing with disc harrow followed by planking after pre-sowing irrigation and rest of plots were left undisturbed. Sowing was done on 23rd November, 2017 in all the plots and next day well chopped pearlmillet residue was applied in plots with treatment zero tillage + residue. Uniform seed rate @ 90 kg ha-1 was used in each tillage practice. All agronomic practices were carried out as per recommendation.

Result and Discussion

Growth parameters

The different tillage practices failed to produce significant variation on plant height, dry matter accumulation and tillers irrespective of growth stages of barley [Table-1]. All the tillage practices received equal amount of nutrients and planted on the same date which rendered significant variation in growth parameters of barley crop. Sowing methods did not influence the plant height and dry matter accumulation of barley [8].

Growth parameters improved with the advancement of crop stage up to harvest, however, number of tillers were declined at harvest as compared to 90 days after sowing irrespective of barley varieties [Table-1].

Table-1 *Effect of tillage practices and genotypes on growth of barley*

Treatment	Plant stand	Plant height (cm)				Dry matter accumulation (g/m²)				Number of tillers (m²)			
	(20 DAS)	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
Tillage practices													
CT	39.1	28.8	59.5	105.5	112.1	31	353	776	1112	321	473	539	525
ZT	38.6	28.7	60.5	106.2	113.1	30	357	785	1118	319	476	531	515
ZT + R	38.10	27.6	59.3	104.7	111	30	347	772	1106	319	467	517	497
S Em ±	0.24	0.3	0.4	1.2	0.4	0.4	3.65	3.11	6.07	5.22	2.3	4.57	6.65
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Varieties													
BH 902	37.94	28	61.6	112.3	123.9	31	356	789	1128	294	436	485	465
BH 946	38.5	29.4	61	108.4	113.3	30	353	790	1125	301	447	490	478
RD 2552	39.11	27.8	60.2	107.6	114.2	31	367	794	1149	305	449	496	480
DWRB 101	39.22	28.2	57.8	99.6	104.4	31	345	759	1060	349	513	585	569
DWRUB 52	38.28	28.3	58.4	99.3	104.3	29	340	756	1098	349	515	589	570
S Em ±	0.42	0.4	0.7	1.1	1.2	0.8	6.04	5.43	13.9	4.48	4	4.8	7
CD at 5%	NS	NS	2.1	3.3	3.6	NS	18	16	40.8	13.2	11.9	14.3	20

Table-2 *Effect of tillage practices and genotypes on yield attributes and yield performance of barley*

Treatment	Yield attributes				Yield & Harvest index		
	Spikes/m² (No.)	Spike length (cm)	Grains/spike (No.)	1000-grain wt. (g)	Biological yield (kg/ha)	Grain yield (kg/ha)	Harvest index (%)
Tillage practices							
CT	376	6.97	40.83	47.16	10840	4755	43.9
ZT	373.6	7.14	40.17	46.98	10763	4688	43.6
ZT + R	364.8	6.94	39.35	46.75	10589	4597	43.5
SEm ±	6.3	0.05	0.42	0.15	114	47	0.2
CD at 5%	NS	NS	NS	NS	NS	NS	NS
Varieties							
BH 902	321.8	6.77	50.16	48.78	11020	4374	39.7
BH 946	346.7	6.88	51.09	43.75	11277	5011	44.4
RD 2552	349.3	6.72	49.c48	43.46	11229	4909	43.7
DWRB 101	419.1	6.92	25.1	49.7	10108	4577	45.3
DWRUB 52	420.4	7.79	24.75	49.13	10020	4528	45.2
SEm ±	7.4	0.16	0.57	0.56	170	80	0.2
CD at 5%	21.6	0.47	1.66	1.63	500	236	0.5

Among varieties, tallest plants were recorded in BH 902 from 60 days after sowing to harvest though it was at par with WH946 and RD 2552 at 60 DAS, however, beyond 60 days it produced significantly tallest plants among all varieties. DWRB 101 and DWRUB 52 being at par with each other produced shorter plants as compared to BH 902, BH 946 and RD 2552 at all growth stages. Dry matter accumulation was recorded significantly lower in DWRB 101 and DWRUB 52 as compared to rest of varieties. This might be because of shorter plants of these varieties compared to rest of varieties. Number of tillers was recorded higher in DWRB 101 and DWRUB 52 compared to rest of varieties which was due to genetic potential of these varieties. Moreover, two rowed barley varieties (DWRB 101 and DWRUB 52) have higher number of tillers as compared to six rowed barley varieties. Variation in growth parameters of barley varieties has also been reported by Newton *et al*., 2012 [9].

Yield and yield attributes

The different tillage practices failed to produce significant variation on yield attributes *i.e*. spike number, spike length, grains per spike and 1000 grain weight of barley. The non-significant differences may be due to the reason that soil physical and chemical properties were not influenced by tillage practices. For significant variation in these properties long term experimentation will be required. Barley varieties varied significantly in relation to yield and yield attributes [Table-2]. Barley variety DWRUB 52 being at par with DWRB 101 produced significantly higher number of spikes, spike length as compared to BH 902, BH 946 and RD 2552, whereas, contrary to these number of grains were found significantly lower in DWRB 101 and DWRUB 52. The difference may be due to difference in genetic makeup of varieties. The variation in yield attributes of barley varieties has been reported by Chatterjee *et al*., 2016 [10]. BH 902 produced significantly bolder grains as compared to BH 946 and RD 2552. No significant variation in 1000 grain weight was recorded between DWRB 101 and DWRUB 52.

No significant variation in grain yield of two rowed barley varieties (DWRB 101 and DWRUB 52) was recorded, however, these varieties produced significantly lower grain yield as compared to rest of the varieties which were six rowed. BH 946 being at par with RD 2552 produced significantly higher grain yield than BH 902, DWRB 101 and DWRUB 52 which was because of the combined effect of yield attributes. Variation in yield attributes of barley varieties has also been reported by Tripathi *et al*., 2017 [11]. Harvest index of two rowed barley varieties *i.e*. DWRB 101 and DWRVB 52 being at par with each other was recorded higher than six rowed barley varieties *i.e*. BH 902, BH 946 and RD 2552.

Application of research: Improve crop yield with cultivation of suitable barley variety under conservation Agriculture. Performance of varieties varies correspondingly with their genetic potential and existing environment.

Research Category: Agronomy, Conservation Agriculture

Abbreviations: ZT- Zero Tillage, NT- No Tillage, Ct- Conventional Tillage

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Study area / Sample Collection: Chaudhary Charan Singh Haryana Agricultural University, Hisar, 125004, Haryana, India

Cultivar / Variety / Breed name: BH 902, BH 946, RD 2552, DWRB 101 and DWRUB 52

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