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Effect of tillage and crop establishment techniques on growth and yield attributing of wheat

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Abstract

A field experiment was conducted during the consecutive rabi seasons of 2018 and 2019 on sandy clay loam at Research Farm, College of agriculture, RVSKVV, Gwalior (M.P.) to study the evaluation of tillage and crop establishment techniques for improving quality of wheat. Variety (V3) MP3336 were resulted in significantly higher protein content (10.92%), which was statistically at par with variety (V1) GW-322 (10.35%) over variety RVW-4106. On the basis of resources conservation technique, maximum protein content (10.93%) was observed with Furrow irrigated raised bed (S1) which was at par (10.35%) with Zero tillage (S4) in wheat.

Keywords: Protein, variety, tillage, wheat

Introduction

Second most important crop in India and a principal source of calorie intake. It provides 50% of calories and protein requirement for the vast population (Tripathi *et al.*, 2017) [6]. Total food grain production estimate hits the record of 277.49 million tonnes in India (Ministry of Agriculture and Farmers Welfare 2017-18) [1]. In India, wheat is cultivated in an area of 305.97 Lakh hectares with 98.38 million tonnes production and 3216 kg/hectare productivity (Ministry of Agriculture and Farmers Welfare 2016-17) [2]. The major wheat growing states in the India are Uttar Pradesh, Punjab, Haryana and Madhya Pradesh. Uttar Pradesh ranks first among all the states of India in terms of both area and production of wheat. Wheat has got an important role in, 'Green Revolution'. The highest production of wheat in the country is in Uttar Pradesh (28.36%) followed by Punjab 17.74% and Madhya Pradesh (15.94%) in 2014-15 (Singh, 2018). Both vegetarian and non-vegetarian consumer eats wheat and its products. Some of its products are biscuit, bread, noodles, pasta etc. Wheat also contributes essential amino acids, minerals, vitamins, and beneficial phytochemicals with dietary fibre components to the human diet and these are particularly enriched in whole grain products (Shewry, 2009) [4]. It contains carbohydrate (78.10%), protein (14.70), fat (2.10%), minerals (2.10%) and considerable proportions of vitamins (thiamine and vitamin-B) and minerals (zinc, iron) (Kumar, 2011) [3].

Materials and Methods

An experimental was conducted at R.V.S.K.V.V., Gwalior (26.13° N' and 76.14° E') in Madhya Pradesh during the Rabi seasons of 2018 and 2019. The area has semi-arid and sub-tropical climate with extreme weather condition having hot and dry summer and cold winter. Generally, monsoon sets in the last week of June. Annual rainfall ranges from 700 to 800 mm most of which falls during last week of June to the middle of September. The maximum temperature goes up to 47°C during summer and minimum as low as 2.8°C during winter. A combination of 16 treatments, *viz.* Main plot-Resource conservation techniques, Furrow Irrigated Raised Bed (S1), Convention (S2), Reduced tillage (S3), Zero tillage (S4) and Sub plot (Wheat variety), GW-322 (V1), RVW-4106 (V2), MP-3336 (V3) and HI-1544 (V4), were tested in a split plot design, replicated thrice and sandy clay loam with 58.34% sand, 19.82% silt and 21.84% clay. During the treatment, plot were present available Nitrogen 192.5 and 187.0 kg/ha, available phosphorus 16.5 and 17.2 kg/ha and available potash 236.2 and 228.6 kg/ha with 7.80 and 7.74 pH and 0.41 and 0.43% of organic carbon. The recommended dose of fertilizers, i.e. 80 kg N/ha, 40 kg P₂O₅/ha and 20 kg K₂O/ha was applied before sowing in the seed row zone.

Nitrogen, Phosphorus and potash were applied through urea, single superphosphate and Murate of potash, respectively.

Results and Discussion

Plant height (cm)

Resource conservation techniques

Plant height recorded under various resource conservation techniques age were in descending order as $S_1 > S_4 > S_3 > S_2$ during both the years of the study.

At harvest, plant height was found highest range recorded in (S_1) furrow irrigated raised bed (FIRB) 22.21 cm and 22.40 cm at 30 DAS, 68.57cm and 70.38 cm at 60 DAS and 99.35

cm and 101.85 cm at harvest during first and second year of experimentation and lowest were recorded in (S_2) conventional tillage during first and second year of experimentation, respectively.

Wheat varieties

On pooled basis, maximum height (99.59 cm) was recorded in variety (V_3) MP3336, followed by variety (V_1) GW-322 with 97.94 cm height. The variety (V_2) RVW-4106 shows a minimum height 92.91 cm during both the season at harvest stage respectively.

Table 1: Effect of resource conservation techniques and wheat varieties on plant height (cm) square of wheat

Treatments	Plant height (cm)								
	30DAS			60DAS			At harvest		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
Main - plot treatment (Resource conservation techniques)									
S ₁ : Furrow irrigated raised bed (FIRB)	22.21	22.40	22.31	68.57	70.38	69.47	99.35	101.85	100.60
S ₂ : Conventional tillage	20.07	20.19	20.13	62.04	63.03	62.54	91.58	93.14	92.36
S ₃ : Reduced tillage (one cultivation with planking followed by sowing)	20.26	20.55	20.41	64.83	67.32	66.07	94.91	95.05	94.98
S ₄ : Zero tillage	21.48	21.90	21.69	67.24	68.50	67.87	97.37	97.80	97.58
S.Em±	0.465	0.312	0.280	0.966	1.301	0.810	1.512	1.680	1.130
C.D. (p=0.05)	1.610	1.081	0.864	3.344	4.502	2.497	5.233	5.812	3.482
Sub- plot treatment (wheat varieties)									
V ₁ : GW - 322	21.40	21.43	21.41	66.28	68.58	67.43	97.65	98.23	97.94
V ₂ : RVW - 4106	19.30	19.58	19.44	63.12	64.61	63.86	92.60	93.23	92.91
V ₃ : MP - 3336	23.08	23.74	23.41	68.90	70.71	69.80	99.38	99.80	99.59
V ₄ : HI - 1544	20.25	20.29	20.27	64.38	65.33	64.85	93.60	96.57	95.08
S.Em±	0.432	0.338	0.274	1.251	1.037	0.813	1.846	1.442	1.171
C.D. (p=0.05)	1.260	0.986	0.778	3.652	3.027	2.309	5.389	4.208	3.327
Interaction (S X V)	NS	NS	NS	NS	NS	NS	NS	NS	NS

Total no. of tillers per meter row length

The maximum no. of tillers per meter row length was found in RCT(S_1) furrow irrigated raised bed (FIRB) the range of 40.40 to 41.34 at 30 DAS, 74.50 to 75.00 at 60 DAS and 88.31 to 89.77 at harvest stage during 2018 and 2019 years of experiment, respectively. The two years pooled data revealed that significantly maximum number of tillers /m row length (40.87), (74.75), (89.04) was recorded in RCT (S_1) Furrow irrigated raised bed (FIRB) at 30 DAS, 60 DAS and at harvest stage. Followed by RCT (S_4) Zero tillage of experiment

respectively.

The data pertaining to no. of tillers per meter row length at all growth stages in table 4.3. Highest no. of tillers per meter row length was recorded in variety (V_3) MP 3336, (41.0 and 41.29), (75.61 and 74.49) and (88.48 and 89.97) per meter row length at 30 DAS, 60 DAS and at harvest stage during first and second years of experimentation at par with variety (V_1) GW-322 (86.64) per meter row length and GW-322 also at par with HI1544 which is inferior with MP-3336 on the basis of pooled data at all growth stage.

Table 2: Effect of resource conservation techniques and wheat varieties on total no. of tillers per meter row length of wheat

Treatments	Total no. of tillers per meter row length								
	30DAS			60DAS			At harvest		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
Main - plot treatment (Resource conservation techniques)									
S ₁ : Furrow irrigated raised bed (FIRB)	40.40	41.34	40.87	74.50	75.00	74.75	88.31	89.77	89.04
S ₂ : Conventional tillage	36.80	37.83	37.31	68.87	71.02	69.94	80.77	83.50	82.14
S ₃ : Reduced tillage (one cultivation with planking followed by sowing)	37.28	38.90	38.09	71.66	72.97	72.31	83.79	86.18	84.99
S ₄ : Zero tillage	39.14	39.96	39.55	73.62	72.62	73.12	86.73	88.50	87.61
S.Em±	0.68	0.69	0.49	0.56	0.93	0.54	1.51	1.26	0.98
C.D. (p=0.05)	2.37	2.39	1.50	1.94	3.22	1.68	5.22	4.37	3.03
Sub- plot treatment (wheat varieties)									
V ₁ : GW - 322	39.48	40.32	39.90	72.41	74.39	73.40	85.87	87.41	86.64
V ₂ : RVW - 4106	35.91	37.26	36.59	69.48	70.54	70.01	81.42	83.90	82.66
V ₃ : MP - 3336	41.07	41.29	41.18	75.61	74.49	75.05	88.48	89.97	89.22
V ₄ : HI - 1544	37.16	39.16	38.16	71.14	72.20	71.67	83.84	86.67	85.25
S.Em±	0.79	0.90	0.60	0.52	1.38	0.74	1.73	1.30	1.08
C.D.(p=0.05)	2.30	2.62	1.69	1.50	4.02	2.09	5.05	3.79	3.07
Interaction (S X V)	NS	NS	NS	S*	NS	S*	NS	NS	NS

Conclusion

Application of Variety (V3) MP3336 were higher plant height and no. Of tillers) with Furrow irrigated raised bed (S1), followed by by Zero tillage (S4) and reduced tillage (S4) can be used to get higher qualitative products in Rabi season in Gwalior region.

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