International Journal of Genetics
ISSN: 0975-2862 & E-ISSN: 0975-9158, Volume 11, Issue 6, 2019, pp.-604-606.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000226

Research Article

INFLUENCE OF SOWING METHODS AND SEED TREATMENTS ON GROWTH AND YIELD PERFORMANCE OF WHEAT (*TRITICUM AESTIVUM* L.)

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Received: May 09, 2019; Revised: June 14, 2019; Accepted: June 15, 2019; Published: June 30, 2019

Abstract: The field experiment was conducted during *Rabi* 2017-18 at field experimentation centre, Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad U.P. Experiment comprising two different sowing method *viz*. P1- SWI method (20cm x 20cm), P2- Broadcasting method along with seed treatment. This study has been planned to find out the response of wheat to planting geometry and seed treatment under SWI technique. The interaction effect by SWI and $ZnSO_4$ (1.0%) recorded significantly higher value in Number of tillers par plant, test weight and grain yield.

Keywords: Seed treatment, Sowing method, SWI, Broadcasting, Wheat

Citation: Rai S.K., *et al*., (2019) Influence of Sowing Methods and Seed Treatments on Growth and Yield Performance of Wheat (*Triticum aestivum* L.). International Journal of Genetics, ISSN: 0975-2862 & E-ISSN: 0975-9158, Volume 11, Issue 6, pp.- 604-606.

Introduction

Wheat is one of the leading food crops of the world farming and occupies significant position among the cultivated cereals. Cultivation of wheat has been the symbolic of green revolution that played pivotal role in making the nation a food surplus nation. Wheat (*Triticum aestivum* L.) is a member of the Gramineae family with chromosome number 42 and a self-pollinated crop. Presently wheat is grown in about 29-million-hectare area with a production and productivity of 85.9 million tones and 29 q/ha, respectively and it contributes nearly 35 percent to the national food basket [1]. Among winter crops, it contributes nearly about 49 percent of food grains. Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, Maharashtra, Gujarat, Karnataka, West Bengal, Uttarakhand and Himachal Pradesh are the main wheat producing states of India. Having seen the tremendous benefits of system of crop intensification (SCI) in many crops, an innovative method of wheat cultivation termed as system of wheat intensification (SWI) is gaining popularity among the small and marginal farmers of India as an effective, efficient and sustainable method of wheat production to meet the food security of the country and future. Planting geometry and seed treatment under SWI technique have not yet been evaluated in the agro climatic conditions and the literature available regarding the planting geometry and seed treatment is meagre. Hence this study has been planned to find out the response of wheat to planting geometry and seed treatment under SWI technique with the following objectives:

To study the effect of pre sowing treatment on growth and yield performance of wheat.

To find out suitable sowing method on growth and yield of wheat.

Materials and Methods

The field experiment was conducted during *Rabi* 2017-18 at field experimentation centre, Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad U.P. The wheat seed cv. HD-2967 obtained from the SHUATS, Allahabad. Experiment comprising two different sowing method *viz*. P1- SWI method (20cm x 20cm), P2- Broadcasting method along with seed treatment *viz*. T0: Control (untreated), T1: Zinc sulphate ($ZnSO_4$) @ 0.5%, T2: Zinc sulphate ($ZnSO_4$) @ 1.0%, T3: Magnesium sulphate ($MnSO_4$) @ 0.5%, T4: Magnesium sulphate ($MnSO_4$) @ 1.0%, T5: Iron Sulphate ($FeSO_4$) @ 0.5%, T6: Iron Sulphate ($FeSO_4$) @ 1.0% was conducted in split plot design with sowing method assigned to main plot and seed treatment in sub plot with three replications. The data were recorded on 11 characters *viz*. Days of 50% heading, Plant height (cm), Days to 50% Maturity period, Number of effective tillers per plant, Length of ear head (cm), Number of grain per ear head, Test weight of grain (gm), Grain yield (q/ha.), Straw yield (q/ha.), Total biological yield (q/ha.) and Harvest index.

Result and Discussion

Analyzed data revealed that the influence of sowing method was significantly higher under the system of wheat intensification (SWI) *viz*. Days to 50% heading (89.67), Plant height (100.32 cm), Number of tillers per plant (16.70), Length of ear head (13.05 cm), Number of grain per ear head (72.54), Test weight (42.70 gm), Grain yield (42.57 q/ha), Straw yield (47.30 q/ha), and Total biological yield (89.93 q/ha). However, the Harvest index was found to be non-significant under the sowing methods. Wider spacing decreased competition between plant for light, water, space and nutrient due to higher leaf area index per plant, light interception, root distribution and nutrient availability that play important role in plant growth [2-4]. Wider spacings reduced competition between plants for water, nutrient, light and space that lead better growth of plants and yield and yield attributes i.e. length of ear head and number of grains per ear head [5-6]. Significantly higher Number of tillers per plant (15.81), Length of ear head (12.02 cm), Number of grain per ear head (63.97), Grain yield (40.07 q/ha) and Total biological yield (81.79 q/ha) produced where seed treated by $ZnSO_4$ (1.0%) than the Plant height (99.67 cm) and Straw yield (42.42 q/ha) were found under the seed treated by $MnSO_4$ (1.0%). However, the maturity period of crop was found to be non-significant under the seed treatment. These results coincide with the finding of Badiri, *et al*., [7] who reported that total biomass significantly increased with Zn, Fe, Mn seed priming. Mehri [8] also observed that priming methods and time increased biological yield of soybean. Abdolrahmani, *et al*., [9] stated that in Zn-deficient soils, plants of Zn-rich seeds produced higher dry matter and absorbed Zn with higher efficiencies at the later growth stages.

Table-1 *Influence of sowing methods and seed treatments on growth and yield attributes of wheat*

Treatment Details	Days to 50% Heading	Plant Height (cm)	Maturity Period	Tillers/ Plant	Ear Length (cm)	grain/ear head	Test Weight (gm)	Grain Yield (q/h)	Straw Yield (q/h)	TYB (q/h)	Harvest Index
S_1	89.67	100.32	126.67	16.7	13.05	72.54	42.70	42.57	47.30	89.93	47.30
S_2	86.81	92.67	121.95	9.74	10.15	52.77	40.80	31.39	35.78	67.18	46.72
SEd ±	0.164	0.077	0.142	0.169	0.058	0.307	0.161	0.17	0.782	0.964	0.379
C.D. (5%)	2.095	0.989	1.815	2.156	0.747	3.91	2.058	2.164	9.937	12.254	4.819
F-Test	S	S	S	S	S	S	S	S	S	S	NS
T_0	87.67	92.91	123.67	11.42	10.94	58.53	39.76	35.29	40.22	75.51	46.73
T_1	88.33	96.47	124.33	15.81	12.02	63.97	43.34	40.07	41.26	81.79	48.68
T_2	88.00	97.54	124.17	14.20	11.81	63.37	42.23	38.89	39.27	78.21	49.47
T_3	88.50	99.67	124.50	13.02	11.69	63.10	41.99	35.23	45.42	80.64	49.08
T_4	88.33	98.69	124.33	13.13	11.65	63.03	41.83	37.08	42.21	79.23	46.81
T_5	88.50	95.30	124.83	12.23	11.57	62.98	41.70	35.68	41.33	76.99	46.37
T_6	88.33	94.92	124.33	12.76	11.54	63.60	41.40	36.44	41.07	77.52	46.94
SEd ±	0.413	0.619	0.416	0.511	0.172	0.371	0.179	0.646	1.613	1.776	0.948
C.D. (5%)	1.01	1.515	1.018	1.25	0.421	0.909	0.439	1.582	3.948	4.347	2.32
F-Test	NS	S	NS	S	S	S	S	S	S	S	S

Table-2 *Interaction effect of sowing methods and seed treatment on growth and yield attributes of wheat*

Treatment Details	Days to 50% Heading	Plant Height (cm)	Maturity Period	Tillers/ Plant	Ear Length (cm)	grain/ear head	Test Weight (gm)	Grain Yield (q/h)	Straw Yield (q/h)	TYB (q/h)	Harvest Index
$S_1 T_0$	88.33	95.90	125.33	13.67	12.39	68.53	40.79	39.39	44.88	84.27	46.73
$S_1 T_1$	89.33	100.44	126.33	20.13	13.55	74.06	44.72	48.50	46.74	96.15	50.44
$S_1 T_2$	89.33	101.57	126.33	17.53	13.25	73.20	42.80	46.74	42.76	89.14	52.12
$S_1 T_3$	90.66	103.73	127.66	16.66	13.06	72.66	42.80	39.04	54.78	93.83	41.46
$S_1 T_4$	90.00	103.12	127.00	16.90	13.15	73.20	42.81	42.74	48.49	91.13	47.00
$S_1 T_5$	90.33	98.94	127.33	15.62	12.99	72.40	42.67	40.03	46.96	86.96	46.02
$S_1 T_6$	89.66	98.56	126.67	16.47	12.96	73.43	42.31	41.58	46.48	88.07	47.17
$S_2 T_0$	87.00	89.91	122.00	9.27	9.49	48.74	38.72	31.19	35.56	66.76	46.72
$S_2 T_1$	87.33	92.51	122.33	11.49	10.48	53.89	41.96	31.64	35.79	67.44	46.91
$S_2 T_2$	86.66	93.51	122.00	10.84	10.36	53.53	41.65	31.51	35.78	67.28	46.81
$S_2 T_3$	86.33	95.59	121.33	9.37	10.3	53.53	41.17	31.41	36.07	67.45	46.52
$S_2 T_4$	86.66	94.24	121.67	9.35	10.15	52.86	40.86	31.40	35.93	67.33	46.62
$S_2 T_5$	86.66	91.65	122.33	8.83	10.14	53.56	40.72	31.33	35.71	67.03	46.72
$S_2 T_6$	87.00	91.28	122.00	9.04	10.12	53.26	40.72	31.28	35.66	66.97	46.71
SEd ±	0.584	0.876	0.588	0.722	0.243	0.525	0.254	0.914	2.281	2.512	1.341
C.D. (5%)	1.429	2.143	1.44	1.768	0.596	1.285	0.621	2.238	5.583	6.148	3.281
F-Test	NS	NS	S	S	NS	NS	S	S	S	NS	S

Arif, *et al*., [10] also reported that seed priming in Zinc solution significantly affected biological yield of wheat and chickpea. The increase in biological yield might be due to better early seedling growth and plant nutrition as report by Zheng, *et al*., [11].

The interaction effect of sowing method and seed treatment on the Number of tillers per plant (20.13), Test weight (44.72 gm) and Grain yield (48.50 q/ha) were found to be significant where seed sowing under SWI and seed treated by $ZnSO_4$ (1.0%) than Harvest index (52.12) was significantly higher where seed sowing under SWI and seed treated by $ZnSO_4$ (0.5%), Maturity period (127.66) and straw yield (54.78 q/ha) significantly higher under the SWI and seed treated by $MnSO_4$ (1.0%). However, Days to 50% heading, Plant height, Length of ear head, Number of grain per ear head and Total biological yield (TYB) were found to be non-significant.

Conclusion

From the present investigation it can conclude that on the basis of performance sowing method system of wheat intensification and $ZnSO_4$ (1.0%) recorded higher in growth and yield attributes. Since these results are based on one year data. Further research is needed with those methods of sowing and seed treatment to substantiate the results.

Application of research: Study of sowing methods and seed treatments on growth and yield attributes of wheat

Research Category: Seed Treatment

Acknowledgement / Funding: Authors are thankful to Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, 211007, Uttar Pradesh

***Research Guide or Chairperson of research: to Dr Bineeta M. Bara**
University: Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, 211007, Uttar Pradesh
Research project name or number: PhD Thesis

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Field Experimentation Centre, Department of Genetics and Plant Breeding, Naini Agricultural Institute

Cultivar / Variety / Breed name: Wheat (*Triticum aestivum* L.) - HD-2967

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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