INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 16, No. 3, p. 548-552, 2020

RESEARCH PAPER OPEN ACCESS

Efficacy of different sowing geometry on wheat yield and cultivation in Pothwar Region

Muhammad Kamran Shafi*[1], Zia-ul-Haq[1], Muhammad Yasin[1], Asim Gulzar[1], Muhammad Ansar[2]

[1]*Faculty of Agricultural Engineering and Technology, PMAS Arid Agriculture University, Rawalpindi, Pakistan*

[2]*Faculty of Crop and Food Sciences, PMAS Arid Agriculture University, Rawalpindi, Pakistan*

Key words: Wheat, Seed drill, Weeds, Row spacing, Growth, Yield attributes

http://dx.doi.org/10.12692/ijb/16.3.548-552 Article published on March 30, 2020

Abstract

Population of Pakistan is increasing at alarming rate, at the same time natural resources i.e. water, land, air are depleting rapidly due to horizontal expansion of cities, climate change and industrialization etc. The innovation in agricultural mechanization can increase farm production per unit area. Wheat is cereal grain, used as staple food in the country; its productivity depends upon water and fertilizer availability, quality and its seed rate. Most of the Pothwar region is rain fed; irrigation system is not available, only the rain is an alternative natural source, which hardly fulfills the crop water requirements, beside the crop requirements weeds infestation also compete with the wheat for water uptake, which is the major cause of low productivity. To decrease weeds infestation and to increase wheat production, an experiment was planned by using different inter row spacing. Research experiment was performed at University Research Farm Koont Chakwal to investigate effect of sowing geometry on wheat yield and cultivation in Pothwar region of Punjab province. In this experiment, inter-row distance was investigated at four levels, i.e. 15, 20, 25 and 30cm. For interculture operation plow bottoms of M.B plow was adjusted used to control weed in 25 and 30cm inter-row distance experiment, yield difference was monitored and comparison was made between 15 to 20cm row distance wheat sown experiments, without using interculture practice with 25 and 30cm inter-row spacing with interculture operation. Most beneficial inter-row distance to control weed was 30cm, thus to increase production was recommended for farmers of Pothwar region.

* **Corresponding Author:** Muhammad Kamran Shafi ✉ engr.kamranshafi@gmail.com

Introduction

Wheat is considered as the global major source of human food diet across the globe, followed by rice and maize. During year of 2017-2018 in our country, the wheat crop is cultivated on an area of 9.05 million hectares, with a production ratio of 25.2 million tons. The increase in the area is due to attractive market rates and introduction of early maturity cotton varieties (Anonymous, 2018).

The impact of wheat production is very vital for the country economy and has a social impression as well. Although Pakistan is agrarian based economy but still importing wheat. Agronomics and engineering practices such as planting geometry play pivotal role in the stability of yield (Baksh *et al.,* 2006).

The proper wheat cultivar gave good produce in various climatic conditions, while as internal genetic factors the cultivars have shown different responses in terms of their grain yield potentials and that reasons make the choice difficult to select the proper wheat cultivar for the specific areas under various environmental conditions. The main objectives of this experiment were to compare normal row spacing 30cm & 45cm (Anwar *et al.,* 2011).

The yield of crops depends on genotypes (variety's genetic potential), climate (soil and climatic conditions) and practices in management. The genotypes of crops can differ in their growth and yield factors (bricks / m2, spike / m2, grains / spike, grain weight). To harvest maximum productivity, the correct combination of these yield attributes is needed. Generally speaking, the most significant contributor among wheat yield attributes is spikes / m2. Optimum density can be obtained by changing the seed level based on the successful tillering of a cultivar. High-tillering varieties can produce higher yields at low seed levels and vice versa (Bakht *et al.*, 2007). For wheat growing areas, the cultural weed control approach is used more frequently because it is an environmentally friendly weed control measure and it uses different agricultural practices to kill weeds. Using hoe, pick axe and spade, etc., this method can be used with stirring soil through weeding and intercultural practices. In addition, yield can be decreased in narrow spacing due to increased nutrient and moisture competition from plants. Another important factor is the choice of wheat genotypes for higher yields and greater tolerance to adverse conditions and early maturity. (Kumar *et al.*, 2013).

Wheat is a major cereal crop and the population is increasing slowly, the increase in its production and the highest priority should be given to achieving food and nutritional safety in the region. Nowadays, due to infestation of weeds, it has become important to sow the good genotype in lines with an acceptable row spacing that can aid in cultural operations, application of herbicides, intercropping and increasing or decreasing seed level without adverse effects on the final yield of grain (Mukherjee, 2016).

Materials and methods

To investigate appropriate sowing geometry experiment was conducted during 2018-19 at University Research Farm (URF) Koont. The trail has been planned to check different row-spacing for wheat at URF- Koont of PMAS Arid Agriculture Rawalpindi to remove weeds from crop. The experimental area for this research was fall in the district Rawalpindi, Pothwar region of Punjab province.

Crop species

Crop species is considered as an important parameter, which influence the design dimensions of the intercultural implement to be adopted. The operational process of intercultural implement is also influenced, since the crop types are found to differ in their growth pattern. For the present experiment weeds and its relation with crop production was investigated as test case.

Row to Row Spacing

Important parameter that influences the weeding infestation is row to row spacing of the crop which requires some contemporary adjustments in the overall implement length, effective working width. Specifically, the crop row spacing differs from one agro-ecological region to another agro-ecological region i.e., from rainfed conditions to irrigated system and soil type.

Machine Specification

Rabi drill was design and fabricated to study the effect of sowing geometry on yield and cultivation of wheat. Drill was tested for four level inter-row spacing.

Experimental Procedure

In the present experiment, inter-row distance of Wheat drill was investigated at different four levels, i.e. 15, 20, 25 and 30cm. Half of the experimental area 25 and 30cm inter-row spacing was covered with M.B plow, in addition half part of field was left to compare the yield of both areas.

Treatments

Six different treatments were used in the experiment at different row spacing T_1 15cm, T_2 20cm T_3 25cm T_4 30cm, T_5 25cm earthing up, T_6 30cm earthing up.

Theoretical Field Capacity

$$TFC=\frac{Width(ft)\times speed(\frac{mile}{hr})}{8.25}$$

=6.5*2.04/8.25

=1.60

Effective Field Capacity

$$EFC=\frac{Total\ Area\ (acre)}{Total\ Time\ (hr)}$$

=1/0.75

=1.33

Field Efficiency

To measure the field efficiency, first of all I was measure the effective field capacity and the theoretical field capacity was measured with the help of the formulas.

Field efficiency was calculated by the formula (Carey, 1970).

$$EF=\frac{EFC}{TFC}\times 100$$

Where,

EFC = Effective Field Capacity

TFC = Theoretical Field Capacity

EF = 1.33/1.60*100

= 83.12

Germination count

Well, after the emergence of seedling but before the start of tillering, germination counts were recorded in experimental unit at four different locations in a unit area of 1m² and then calculated on average.

Number of tillers (m-2)

Total number of tillers from a 1m² region randomly selected from each sub-plot was counted at four different locations and then measured on average.

Spikelet per Spike

Ten randomly selected spikes were counted manually, spikelets per spike were counted and the average number of spikelets per spike was subsequently worked out.

Grain per Spike

Ten randomly selected spikes were manually threshed in each plot, the total number of grains was counted and the average number of grains per spike was then worked out.

1000-grain weight (g)

A sample of one thousand grains was taken from each plot and weighed on an electrical balance after drying at 70°C for 24 hours in an oven.

Grain yield (kg/ha)

The crop samples cut for biological yield were manually threshed and grain yield was recorded per plot and then converted to kg / ha.

Results and discussion

Germination count

Results displayed in table 1 that treatment T_6 has the highest germination count (197.0) which is significant to all other treatments. Treatment T_3 is non-significant to the treatment T_5 while treatment T_2 is also non-significant with the treatment T_4.

Table 1. Germination count.

Treatments	Germination Count
T_1	155.20 d
T_2	165.20 c
T_3	178.80 b
T4	168.60 c
T_5	185.20 b
T_6	197.00 a
LSD	8.8863

Mean having same lettering are non-significantly differ from one another at 5% level of probability.

Number of tillers

Results show in table 2 that treatment T_6 has the highest number of tillers (290.0) as compared to others treatments and significant to T_1, T_2 & T_4 while non-significant with T_3 and T_5.

Table 2. Number of tillers.

Treatments	Number of Tillers
T_1	235.40 d
T_2	263.60 c
T_3	285.80 ab
T_4	269.40 bc
T_5	285.60 ab
T_6	290.00 a
LSD	19.055

Mean having same lettering are non-significantly differ from one another at 5% level of probability.

Spikelet per spike

Table 3 shows that treatment T_6 has the highest spikelet per spike (18.0) and highly significant to the treatment T_1 while non-significant with treatment T_2, T_3, T_4 & T_5 having values of (17.8, 15.6, 16.6 & 15.4) respectively.

Table 3. Spikelet per spike.

Treatments	Mean spikelet per Spike
T_1	14.800 b
T_2	17.800 a
T_3	15.600 ab
T_4	16.600 ab
T_5	15.400 ab
T_6	18.000 a
LSD	2.81

Mean having same lettering are non-significantly differ from one another at 5% level of probability.

Grain per Spike

Results displayed in table 4 that treatment T_6 has the highest grain per spike (44.80) and significant to the T_1, T_3 & T_5 while non-significant to the treatment T_2 and T_4.

Table 4. Grain per spike

Treatments	Grain per Spike
T_1	34.800 b
T_2	40.600 ab
T_3	36.800 b
T_4	39.000 ab
T_5	37.400 b
T_6	44.800 a
LSD	5.9922

Mean having same lettering are non-significantly differ from one another at 5% level of probability.

1000-Grain Weight

Results displayed in table 5 shows that treatment T_3 has highest thousand grain weight (34.700 g) which is significant with treatment T_4 and non-significant T_1, T_2, T_5 & T_6 having values (31.00, 32.40, 33.40 & 33.58g). The results are in accordance with Kumar *et al*, 2017 which has difference in the weight of thousand grain.

Table 5. 1000-Grain Weight

Treatments	1000 Grain weight
T_1	31.000 ab
T_2	32.400 ab
T_3	34.700 a
T_4	30.540 b
T_5	33.400 ab
T_6	33.580 ab
LSD	3.7321

Mean having same lettering are non-significantly differ from one another at 5% level of probability.

Yield (g/m^2)

Results displayed in table 6 showed that treatment T_6 has the highest yield (30.080 kg/acre) and significant with the treatment T_1, T_2, T_3 & T_4 while non-significant with treatment T_5. The results are inline with Dhiman Mukherjee which also check different row spacing and practices to control the weeds.

Table 6. Yield.

Treatments	Yield (kg/acre)
T_1	27.080 d
T_2	27.340 cd
T_3	28.500 bc
T_4	28.300 c
T_5	29.600 ab
T_6	30.080 a
LSD	11.992

Mean having same lettering are non-significantly differ from one another at 5% level of probability.

Conclusion

The highest yield was recorded in treatment T_6 with 30cm inter-row distance earthing up of soil with mould bord plough to control the weeds and production in pothwar region.

Recommendation

Treatment T_6 is best recommended method for the wheat farmer to control weeds in pothwar region.

References

Anwar J, Hussain M, Ali MA, Hussain M, Saleem M, Subhani GM, Munir M. 2011. Assessment of adaptability and stability of grain yield in bread wheat genotypes under different sowing times in Punjab. Pak. J. Bot.

Bakht J, Qamer Z, Shafi M, Akber H, Ahmad N, Khan MJ. 2007. Response of different wheat varieties to various row spacing. Sarhad Journal of Agriculture.

Baksh A, Hussain M, Dasti AA, Mahmood S, Aminud M, Naqvi SM. 2006. Study of weeds in wheat fields. Pakistan Journal of Arid Agriculture **9(2),** 41-45.

Dhiman Mukherjee. 2017. Evaluation of Performance of New Wheat Cultivar under Different Row Spacing. International Journal of Current Microbiology and Applied Sciences **6(6),** 3186-3191.

Kumar N, Hooda VS, Gupta G, Devi S, Jinger D. 2017. Performance of wheat under different planting methods and weed management practices. Ann. Agric. Res. New Series Vol. **38(1),** 31-37.

Kumar S, Alam P, Ali N. 2013. Response of wheat (*Triticum aestivum* L. emend. Fori & Paol.) Varieties to sowing dates. Journal of Research KAU.

Mukherjee D. 2016. Influence of fertility levels on the performance of wheat cultivars under new alluvial zone of West Bengal. Journal of Agroecology and Natural Resource Management.