Response of wheat to different seeding rates for yield and yield components

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ABSRACT

On-farm testing (OFT) was conducted to study the response of wheat to different seedling rates for yield and yield components with scientific cultivation in the fields of farmers of Kheda district, Gujarat during rabi season. The popular variety GW-496 was grown with different seeding rates. The different level of seeding rates had significant effect on grain yield. Seed rate of 150 kg/ha resulted in maximum grain yield (2420 kg/ha) while 180 kg/ha seeding rate gave 2202 kg/ha grain yield and lowest grain yield of 2195 kg/ha was obtained from 120 kg/ha seeding rate. The other yield components were non-significantly affected by seeding rates. The higher net income (Rs 12444/ha) was realised in seeding rate 150 kg/ha as compared to 180 (Rs 9816/ha) and 120 kg/ha (Rs 10213/ha). Also 150 kg/ha seeding rate gave higher benefit-cost ratio (1:1.87).

Keywords: Wheat; on-farm testing; seeding rate; grain yield; farmers' practice

INTRODUCTION

Wheat is an important cereal crop for a large number of countries in the world. It provides about 20 per cent of total food calories for human race. It is widely grown throughout the temperate zones and in some tropical areas at higher elevations. The major wheat growing countries are USA, USSR, China, India, Canada, Australia and Pakistan. Among the major cereals grown in India wheat stands second next to rice in area and production but stands first in productivity amongst all the cereals.

In India major wheat growing states are Punjab, Madhya Pradesh, Karnataka, Tamil Nadu, Gujarat, West Bengal and Himachal Pradesh. In India wheat is cultivated over an area of 25.5 million ha and produces 73.3 million tonnes of grain with an average productivity of 2.87 tonnes per ha whereas in Gujarat it is 2482 kg per ha which is far below than the average productivity of nation (Anon 2006).

There are many factors responsible for low yield such as sowing time, selection of varieties, inappropriate seedling rate, improper planting geometry and soil type etc. Among all these agronomic practices, seed rate is most powerful factor that influences the yield. Optimum seed rate is an important requirement for economic yield from an area. Greater plant population is attained by higher seed rate but it gives poor growth and development of that crop. Use of low seed rate does not produce required number of plants in the field and thus results in low yield.

Use of extensive seed rate may cause lodging exhaustion of nutrients and water before maturity and may provide a favorable condition for insects and diseases. Thus planting of wheat at optimum seed rate is very important for economic yield. Ayaz et al (1999) reported that as the seed rate increases number of grains per spike decreases. Marwat et al (1989) reported that the number of plants emerged, grain yield and number of grains per square meter increased with the increased seedling rates. However spike length and the number of grains per spike showed negative behavior to increasing seeding rates. It is also supported by the work of Attarde and Khuspe (1979) who described sowing of optimum quantity of seed most effective attribute for high yields of wheat under irrigated and rainfed situations.

The on-farm testing was done to show the response of wheat to different seeding rates for yield and yield components with scientific cultivation in the fields of farmers of Kheda district, Gujarat during rabi season.

MATERIAL and METHODS

On-farm testing (OFT) was done on an area of 2 ha by involving 3 farmers each year (0.6 ha area with each farmer). Each location was considered a replication. These three replicates of 3 treatments each comprised a total of 12 plots. The treatments used were T_1: 120 kg seeding rate/ha, T_2: 150 kg seeding rate/ha and T_3: 180 kg seeding rate/ha.

Yield and yield attributes

Twenty five plants were selected randomly in each field to measure the plant height at harvesting. The height was taken from the base (ground surface) to the tip of main stem with the help of a scale. At harvest the number of productive tillers/plant was counted from randomly selected plants in each field and finally number of average productive tillers/m^2 in each field was worked out. The spikes of the same five randomly selected plants were also used for counting number of spikelets/spike. Ten spikes from the bulk spikes of all five plants were selected randomly and average of spikelets/spike was worked out. Grains from all the five ears selected for counting number of spikelets/spike were separated manually by beating with stick and the number of grains was counted and mean number of grains/spike was worked out. The produce of each net plot was threshed manually; grain was cleaned and weighed.

Economics

In order to evaluate most effective and remunerative treatment the relative economics of each treatment was computed. Gross realization in terms of rupees per hectare was worked out taking into consideration the prevailing market price of grain during season. Likewise the cost of cultivation was worked out by considering the expenses incurred for cultural operations from preparatory tillage to harvesting. The cost of cultivation was then deducted from the gross realization to work out net realization under each treatment.

RESULTS and DISCUSSION

Yield attributes

The results depicted that the differences in plant height due to seeding rates measured at maturity were not significant (Table 1). However the plant height was shorter with seeding rate of 180 kg/ha compared to 120 kg/ha seeding rate. This may be due to competition among seedlings for food, light and moisture at higher seeding rate. The results are in line with the findings of Yaduraj and Ahuja (1997) and Pandey et al (2004).

The seedling rate had highly significant effect on the number of productive tillers per plant and it decreased with increase in seeding rate. The yield attributing characters like number of spikelets/spike and number of grains/spike were maximum under lower seeding rate (120 kg/ha) than that recorded under higher seeding rates. Similar results were recorded by Pandey et al (1999).

The grain yield was higher (2420 kg/ha) under treatment T_2 (150 kg/ha seeding rate) than T_3 (2202 kg/ha) but it was at par with T_1 (2195 kg/ha). The treatment T_2 recorded 10.25 and 9.9 per cent higher grain yield than that recorded under seeding rate of 180 kg/ha (T_3) and 120 kg/ha (T_1) respectively. Similar observations were made by Singh et al (1999), Ahuja et al (1999) and Pandey et al (2004).

Economics

The data on economics presented in Table 2 indicate that higher net realization of Rs 12444/ha with

Table 1. Effect of different seeding rates on yield and yield and yield compnents in wheat

Parameter	T_1 (120 kg/ha)	T_2 (150 kg/ha)	T_3 (180 kg/ha)
Plant height (cm)	84.35	83.69	82.94
Number of productive tillers/plant at harvest	6.91	6.87	5.77
Number of spikelets/spike	9.53	9.50	8.56
Number of grains/spike at harvest	40.77	43.19	38.80
Grain yield (kg/ha)	2195	2420	2202

Table 2. Effect of different seeding rates on economics of wheat production

Parameter	T_1 (120 kg/ha)	T_2 (150 kg/ha)	T_3 (180 kg/ha)
Net return	10213	12444	9816
BCR	1.73	1.87	1.69

benefit-cost ratio of 1:1.87 was recorded under 150 kg/ha seeding rate as compared to 120 kg/ha and 180 kg/ha. It accrued Rs 2231/ha and Rs 2628/ha more in net realization under seeding rate T_2 (150 kg/ha) over T_1 (120 kg/ha) and T_3 (180 kg/ha) respectively. The findings are supported by the work of Singh et al (1999), Jat and Singh (2003) and Pandey et al (2004).

CONCLUSION

Based on the results of three years on the trial conducted during rabi season on wheat crop it was found that seeding rate of 150 kg/ha was most suitable as growth parameters, yield attributing traits and seed yield attained the higher values.

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