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Comperative Performance of Wheat Seed Increasing %Age in Standing Cotton. I-Relay Cropping System of Cotton Based

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Abstract: The major conflict in the cotton-wheat-cropping system is the prolonged harvesting of cotton resulting in late planting of wheat causing decrease in yield for every day's delay in planting after 15 November. This clearly underlines the need for a solution of the above conflict. The now till technique is now being increasingly demonstrated as a way out. The major objective of the present study was to work out the profitability of planting wheat in standing cotton. The experiment was conducted at Adaptive Research Farm Rahim Yar Khan, during 2011-12, to evaluate the technological feasibility and economic validity of relay cropping system by the different wheat seeding rates. The objective of this study was to check the different seed rates of wheat in standing cotton as relay crop. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Wheat variety Sehar-2006 was used with seed rates such as 125,150,175 and 200 kg/ha. The previous crop was cotton in this field, which was sown on 22nd May 2011. Wheat was sown by surface seeding in standing cotton with different seeding rates. Seed rate of 200 kg ha^{-1} in relaying wheat by surface seeding produced higher grain yield than seeding rate of 150 kg/ha. Yield, yield components and quality traits of cotton were not affected significantly by any of the relay cropping systems. Substantially higher net field benefit was obtained from relay cropping system with seeding rate of 200 kg/ha as compared to wheat followed after cotton.

Keywords: Cotton (*Gossipium hersutum*), Pakistan, relay cropping system, seeding rates, wheat (*Triticum aestivum*), yield

INTRODUCTION

The total land area of Pakistan is nearly 197 million acres, while the population growth rate is 3.1% annually. As our total land area is fixed, which cannot be increased, as expanding population pressure on it (Table 1).

Table 1: Provincial share of wheat area and production in Pakistan

Provinces	Area%	Production%
Punjab	76.00	81.00
Sindh	10.00	12.00
Baluchistan	4.00	4.00
K.P.K	10.06	3.00

(GOP, 2008)

Now a day, poverty alleviation of resource (multiple cropping) can help to reduce poverty. Generally resource poor farmers practice multiple cropping (inter cropping/mixed cropping/relay cropping) to utilize their land intensively to get more benefit. Seeding combination of different crops is profitable, giving high yield, monetary advantage and benefit cost ratio (Ali *et al*., 2007).

At present very low yield of wheat crop is the main cause of poor productivity of cotton-wheat based cropping systems in Pakistan. The low productivity is ascribed to very late sowing after harvest of cotton. Cotton is the most important cash crop of Pakistan and its early picking for timely sowing of wheat seems impossible (Government of Pakistan, 2004). Relay cropping is an effective production system for increasing the income per unit area per unit time (Saeed *et al*., 1999). This situation demands simultaneous increase of cotton and wheat. Delay in sowing of wheat without disturbing our cash crop can be avoided by relaying in standing cotton at optimum sowing time with optimum seeding rate. Preliminary studies on relaying in standing cotton at zero tillage have shown promising results as it resulted in substantially higher yield than that of the conventional sowing after cotton harvest (AARI, 1992). However, further research on

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cotton-wheat based relay-cropping systems with optimum seed rates for wheat in standing cotton is needed in order to develop new relay cropping systems and to evaluate their various agro-physiological and economic aspects. Hopefully such studies will lead to maximize the productivity and income of cotton growers with small landholdings. The objectives of this study were to determine the optimum seeding rates of wheat in standing cotton, production potential and economics of cotton-based relay cropping of wheat. Relay cropping is an effective production system for increasing the income and production per unit area. Relay crops may produce additional income and yield (Chowdhry and Singh, 1982; Rao, 1991). By relay cropping, farmers may be able to effectively extend the growing season by several weeks. This is accomplished by planting the second crop into standing crop before the first crop is harvested. The major conflict in the cotton-wheat-cropping system is the prolonged harvesting of cotton resulting in late planting of wheat. The no till technique is now being increasingly demonstrated as a way out (Chowdhry *et al*., 2000). The yield and all growth parameters of wheat were significantly affected by sowing method and seed rates. Seed rates affected on No. of plants per unit area, spikes per plant and grains per spike (Soomro *et al*., 2009). Under agro- climatic conditions of Pakistan, this technology needs to be evaluated with respect to feasibility and agronomic aspects.

MATERIALS AND METHODS

Location: The experiment was conducted at Adaptive Research Farm Rahim Yar Khan, during 2011-12, to evaluate the performance, technological feasibility and economic validity of relay cropping system by the different seeding rates of wheat. The objective of this study was to check the different seed rates of wheat in standing cotton as relay crop. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Wheat variety Sehar-2006 was used with different seed rates such as 125,150,175 and 200 kg/ha. The previous crop was cotton in this field, which was sown on 22nd May 2011. The pendimethaline 330 EC was used to control weeds in cotton @ 3.75 L/ha.

Soil characteristics: The experimental soil (0-15 cm depth) was analyzed for initial soil physiochemical properties before sowing. Soil texture was loam having the following characteristics; sand 37.00%, silt 41%, clay 22%, pH 8.1, organic matter 0.86%, $CaCO_3$ 5.5%, EC 1.2/dSm, available N 0.86 g/kg, available P 10.5 mg/kg, exchangeable K 240 mg/kg, AB-DTPA extractable Zn 0.93 mg/kg, AB-DTPA extractable Fe 2.95 mg/kg and AB-DTPA extractable Mn 1.15 mg/kg.

Relay cropping pattern: In relay cropping system a higher seed rate was used than recommended. Thereafter, an adequate moisture supply was continued for facilitating seed germination and seedling establishment. Cotton sticks were cut deep. Fertilizer the Diammonium phosphate @ 187 kg/ha was applied to the wheat crop in said field after the removal of cotton sticks in 1st week of January 2012. Urea fertilizer was applied @ 250 kg/ha in three equal doses. While Isoprotoron @ 2000 g/ha was applied for the control of narrow and broad leaved weeds during mid of January 2012. During wheat growing season six irrigations were applied. Harvesting was done during 1st week of May 2012 and threshing was done during 2nd week of May 2012. All other agronomic practices were adopted as per recommendation. Recorded data were analyzed as methodology described by CIMMYT (1988).

Statistical analysis: The data were recorded and analyzed statistically. Least significant difference (LSD) at 5 % probability level was computed to compare treatment means. Randomized Complete Block Design (RCBD) was used to analyze the data (Dowdy and Wearden, 1991). Duncan's multiple range test (Duncan, 1955) was used to see the significance of treatments means at 5% probability level. Regression analysis was done to see the parabolic and linear trends in the wheat yield increase at different levels of potassium fertilizer applications.

RESULTS AND DISCUSSION

Number of plants m^{-2} differed significantly due to seeding rates (Table 2). Maximum plants (176.67 m^{-2}) were recorded in the seeding rate of 200 kg/ha while minimum number (153 m^{2}) was recorded in seeding rates of 125 kg/ha. The results are in line with finding of Sunderman (1999) and Khan and Khaliq (2005) who reported that high seeding rates produced greater number of seedling per unit area and greater emergence percentage than lower seeding rates.

Better tillers (295.66 tillers m^{-2}) was recorded in case of seed rate 200 kg/ha (Table 2) more seeding rate competed the unfavorable and prolong frost period than the low seed rate 125 kg/ha (245 L/m) when we compared the decreases tillering capacity with decreasing seed rate results in minimum differences in tillers. In relay cropping, higher seed rate was used because of improper seedbed. These results are confirmed by finding of Khan and Khaliq (2005) and Lerner and Satorre (1990).

Difference in plant heights were recorded non-significant by using different seed rates. Data of number of grains spike^{-1} revealed that maximum seeding rates gave the maximum number of grains per spike as followed less than treatments.

Non-significant differences in 1000-grain weight were recorded due to different seed rate, however, no

Table 2: Effect of different seed rate on grain yield of wheat in standing cotton during crop season 2011-12 (average of three replications)

Treatments	Germination (m^2)	Fertile tiller (m^{-2})	Plant height (cm)	No. of Grains/Spike	1000-grain weight (g)	Yield (kg/ha)
S_1 Seed rate 125 kg ha	153.00d	245.00d	109.67a NS	36.07b	38.33a	3720c
S_2 Seed rate 150 kg/ha	159.67c	271.66c	106.4a NS	36.13ab	36.33b	4000b
S_3 Seed rate 175 kg/ha	165.00b	280.00b	107.07a NS	38.93a	35.33b	4150ab
S_4 Seed rate 200 kg/ha	176.67a	295.66a	103.87a NS	40.47a	35.00b	4220a

Means within the column sharing the different letters are significantly different (p = 0.05) with each other; NS-non significant

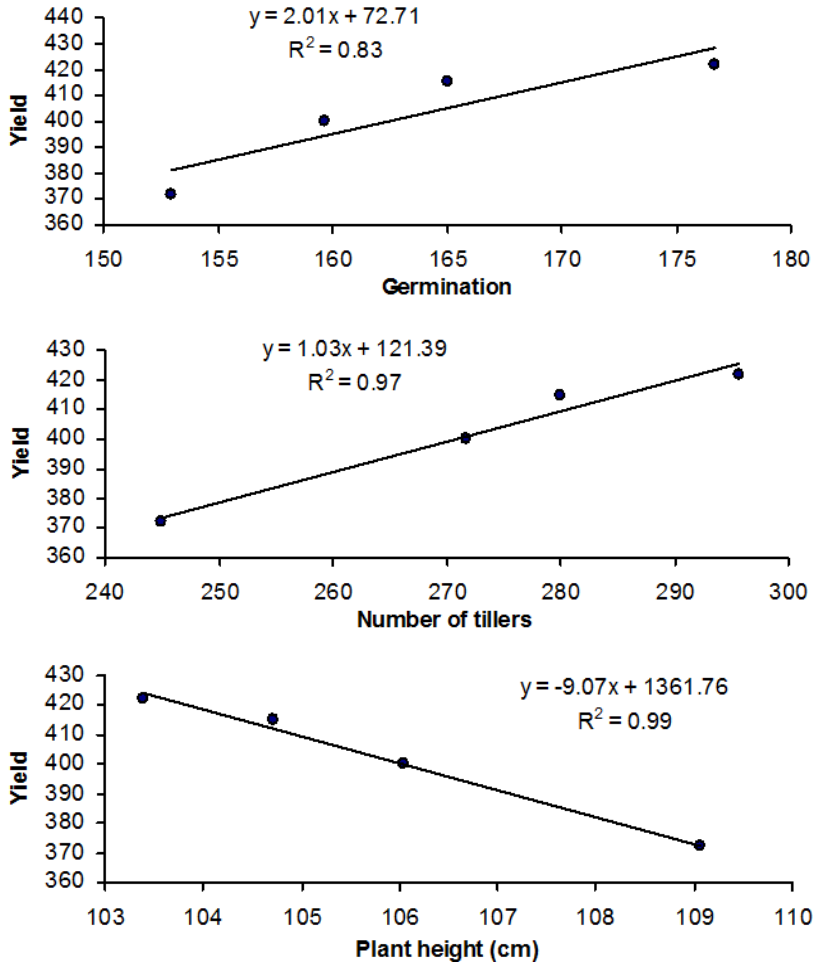

Fig. 1: Effect of different growth parameters on yield of wheat in standing cotton during Crop season 2011-12 (*graphical representation)*

differences in 1000-grain weight were observed by using seed rate more than recommended seed rate (125 kg/ha). These results are in line with the findings of McLead *et al*. (1996) who reported that grain weight was not affected by crop density.

Maximum grain yield (4220 kg/ha) was achieved with seed rate 200 kg/ha mainly due to more fertile tillers m^{-2} and more No. of grains per spike. The results are similar to finding of Akka and Akten (1989), Piech and Stankowski (1989), Andrew *et al*. (1990) and Stapper and Fischer (1990). Who reported that under rainfed condition for better wheat yield, delayed planting could result in lower yield due to shortened duration of wheat growth period (Fig. 1).

Regression analysis of the data indicating a significant ($p<0.05$) parabolic trend and linear trend of increase in wheat yield in standing cotton.

CONCLUSION

It is concluded that sowing of wheat in standing cotton at the seed rate of 200 kg/ha gave maximum return without any cultural practices investment.

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