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Effects of Different Planting Methods on Yield and Yield Components of Wheat

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Abstract: Planting method plays an important role in the placement of seed at proper depth, which ultimately affects crop growth. The selection of suitable planting method for wheat is dependant upon the time of planting, availability of soil water at planting time, amount of residue in the field and availability of planting machine. A study was conducted in 1998-99 at three different sites in the rice-wheat area of Punjab to find out the effect of different planting techniques on yield and yield components of wheat (*Triticum aestivum* L.). Planting methods included bed formation + drill sowing (BDS), broad casting + bed formation (BCB), broadcasting (BC) and drill sowing (DS). Plant emergence was higher in drill sowing method in comparison with other methods. At harvesting, number of heads m^{-2} was higher with BCB and BDS planting system as compared to broadcasting and drill sowing methods. Biological yield was significantly higher in flat planted wheat (broadcasted and drill sown) in comparison with bed planted wheat (BB and DB) Although number of heads m^{-2} , spike length and number of grains per spike were significantly higher in raised bed wheat (broadcasted and drilled beds) in comparison with the flat sown wheat (broadcasting and drill sowing) but wheat grain yields were lower in raised bed wheat than flat sown wheat. In raised bed planted wheat, 1000 grain weight was also significantly lower as compared to flat sown wheat.

Key words: Wheat, yield, sowing method

Introduction

Wheat is grown in Pakistan on more than 8 million ha. Despite the availability of high yielding varieties for different ecological zones, the average wheat grain yield in the country is around 2500 Kg ha^{-1} . Lower wheat grain yield could be due to unavailability of recommended varieties seed, delay in planting, inappropriate planting methods, imbalance use of fertilizers and inefficient water management.

The selection of suitable sowing method plays an important role in the placement of seed at proper depth, which ensures better emergence and subsequent crop growth. Wheat is planted with different sowing methods depending upon the available soil water, time of planting, amount of residue in the field and availability of planting machine. In Pakistan, wheat is planted through broadcasting on a large area after rice harvesting. Broadcasting not only requires higher seed rate but also results in lower plant population. Drill sowing is recommended method because of its uniform seed distribution at desired depth, which usually results in higher germination and uniform stands. Due to better crop stand establishment, wheat grain yield was significantly affected by the different sowing methods including broadcast and line sowing methods (Singh and Singh 1992; Galichenko, 1994; Singh *et al.*, 1994a; Singh *et al.*, 1994b). According to Fenech and Papy (1977) planting with drill is superior to broadcasting if the seed bed is

finely prepared. Shaalan *et al.* (1977) reported that the plant density, ears m^{-2} , number of grains per ear, 1000-grain weight and grain yield were higher in drill sown wheat than broadcasted wheat. Higher wheat grain yields with drill sowing as compared to broadcast were also reported by Kipps (1970).

Planting of wheat on raised beds, a new technique is being widely practiced in Sonora State of Mexico for a long time (Sayre and Ramos, 1997; Hobbs *et al.*, 1998). Wheat planting on raised beds could improve mechanical weed control, water and fertilizer use efficiencies. Bed and furrow method of planting provide ease in water and fertilizer application. This study was conducted to find out the performance of wheat with different sowing methods.

Materials and Methods

The study was conducted at three sites including Kala Shah Kaku, Kamokey and Gujranwala. These sites were located in the Rice- wheat area of Punjab. The trial consisted of four planting methods with three replications in Randomized complete Block Design. Wheat was planted with four different planting methods at the seed rate of 100 kg ha^{-1} . Planting methods included Beds + drill sowing (BDS), broad casting + bed formation (BCB), Broadcasting (BC) and Drill sowing (DS). In the BDS, seed was drilled on already formed beds, whereas the beds were formed with ridger after broadcasting the seed in

BCB. The other planting method included broadcasting and drill sowing. Recommended doses of Nitrogen and Phosphorus fertilizers were applied at the time of planting and first irrigation. Irrigations were given according to the requirements of crop. Weed control was done manually. Data was recorded for emergence m^{-2} , heads m^{-2} , plant height(cm), spike length (cm), grains per spike, 1000 grain wt (gm), biological yield ($kg\ ha^{-1}$) and grain yield ($kg\ ha^{-1}$) was recorded from a sample of 2m X 2m from each plot. Harvest index % was calculated by using the following formula.

$$\frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

The data was analysed by using the method described by (Steel and Torrie, 1980) and means were compared with Duncan's Multiple Range Test (Duncan, 1955).

Results and Discussion

Planting methods had significant effect on the emergence of wheat (Table 1). Highest number of wheat plants emerged with the drill sowing method which was followed by broadcasted beds. On the other hand, wheat emergence was poor with broadcast and drilled bed methods. Higher emergence with drill sowing could be due to the sowing at optimum and uniform depth, whereas the bed formation after broadcasting could have resulted in the placement of seed deeper. Poor wheat emergence in broadcasting as compared to drill sowing was also reported by Shaalan *et al.* (1977).

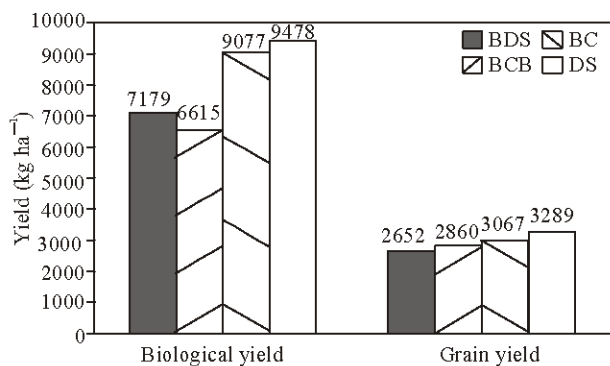


Fig. 1: Effect of different planting methods on yield of wheat

Table 1: Wheat Performance under the different sowing methods

Sowing methods	Emergence m^{-2}	Heads m^{-2}	Plant height (cm)	Spike length (cm)	Grain spike $^{-1}$	1000 grain wt (gm)	H.I %
Drilled Beds (BDS)	130c	259a	86.11ab	9.90a	55.70a	43.5b	37.1b
BroadcastBeds (BCB)	146b	278a	84.11b	9.40b	52.90b	43.5b	43.8a
Broadcasting (BC)	129c	200b	85.90ab	9.20b	50.00c	46.3a	33.8c
Drill sowing (DS)	182a	212b	88.78a	9.30b	50.10c	46.6a	34.7b

At harvesting, number of heads m^{-2} was higher with BCB and DSB as compared to broadcasting and drill sowing methods (Table 1). The number of fertile tillers in bed planted wheat (BB and DB) was 2 per plant, whereas in flat planted wheat (broadcasting and drill sowing) the number of fertile tillers ranged from 1.1 to 1.5 per plant. Better wheat tillering on beds could have been due to better micro environment for wheat on beds as compared to flat.

Biological yield was significantly higher in flat planted wheat (broadcasted and drill sown) in comparison with bed planted wheat (BCB and DSB) (Fig. 1). Despite the lower number of heads m^{-2} in broadcasting and drill sowing methods than BCB and DSB planting methods, the higher biological yield in flat planted wheat could be attributed to more infertile tillers and vegetative growth. There were no significant differences in biological yield of drill sown and broadcasted wheat (Fig. 1).

Although number of heads m^{-2} , spike length and number of grains per spike were significantly higher in raised bed wheat (broadcasted and drilled beds) in comparison with the flat sown wheat (broadcasting and drill sowing) (Table 1) but wheat grain yields were lower in raised bed wheat than flat sown wheat (Fig. 1). Lower grain yield in raised bed planted wheat could be attributed to significantly lower 1000 grain weight in these planting systems as compared to flat sown wheat (Table 1) and improper variety. Water stress at the time of grain filling in raised bed planted wheat could be the reason for lower 1000 grain weight and wheat grain yield.

Non significant grain yield differences between drill sown and broadcasted wheat were observed at all sites, which were similar with the results reported by Desai and Trivedi (1991) and Sarma and Medhi (1995).

Harvest index was significantly higher in wheat planted on raised beds in comparison with the broadcasted and drill sown wheat, which indicated better water use efficiency in term of grain production.

Because of seed placement at proper depth, drill sowing method resulted in better emergence than other planting methods. Better crop stand establishment in drill sown wheat resulted in higher grain and biological yield of wheat in comparison with other planting methods. Despite higher number of heads m^{-2} , spike length and number of grains per spike in raised bed wheat (broadcasted and drilled beds), the wheat grain yields were lower in raised bed wheat than flat sown wheat. Wheat on raised bed

encountered the problem of emergence, which affected its yield ultimately. The problem of crop stand establishment in raised bed could be overcome with the availability of a proper bed planting machine, which should form beds and place the seed at proper depth. With the establishment of optimum crop stand, better yield can be achieved with this technique.

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