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GROWTH AND PRODUCTIVITY OF RABI CROPS AS AFFECTED BY MECHANIZATION

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ABSTRACT: The present study investigated the effect of planting methods on growth and productivity of different *rabi* crops. An experiment was conducted at Advanced Centre of Rainfed Agriculture (ACRA), SKUAST-Jammu, Rakh Dhiansar using factorial randomized block design with three replications. The experiment consisted of three planting methods *viz.*,sowing with multi crop seed drill, sowing with recommended practice (line sowing) and farmers' practice as main factor and four major *rabi* crops wheat, mustard, chickpea and pea. Analysis of the data indicated that planting of various *rabi* crops with multi crop seed drill resulted significantly higher grain and straw/stover yield over recommended practice (line sowing) and farmers' practice.

Keywords: Growth, yield, wheat, mustard, pea, multi crop seed drill.

The predominant crops of *rabi* season of Jammu division of J&K UT are wheat, mustard, chickpea and pea under rainfed conditions. However, yield levels of these crops especially under rainfed areas are very low and are being declined due to improper sowing methods like broadcasting, no use of farm machineries and various other un-improved agronomic practices.

Recent tests have demonstrated that use of farm implements can produce crop yields better than conventional methods of agricultural practices. Further, labour cost and other input cost (fuel, seed & fertilizer) can be reduced to a major extend (Johansen *et al.*, 2012). Seed drill sows seeds at specified rate, proper depth and in rows thus permit inter row cultivation, intercultural operations and also provides good environment for proper root and plant development. Use of seed drills increases the crop yield by 15-25 per cent as compared to conventional broadcasting method (Nirala, 2011).

Farm mechanization has been helpful to bring about significant improvement in agricultural productivity. Thus, there is strong need for mechanization of agricultural operations. The factors that are justified the strengthening of farm mechanization in the country can be numerous. The timeliness of operations has assumed greater significant in obtaining optimal yields from different crops, which has been possible by way of mechanization (Singh 2006).

Mechanization in agriculture is necessary input in present agriculture. It enhances productivity, also reducing human drudgery and cost of cultivation. At present the farm power availability is 1.84 KW/ha (2013-14) which is to be increased upto4.0 KW/haby 2022 (Anonymous, 2016), still there are many parts in country where farm operations are depending on human labour and animal, which significantly reduces the productivity (Yadav *et al.*, 2019).

The Indian economy is based on agriculture and development in agriculture leads to raise economic status of country. In India farmers are facing problems due to unavailability of labours, traditional way of farming using non efficient farming equipment which takes lot of time and also increases labour cost. The main objective of sowing the crops is to place seed at proper position and at particular depth which provide it the optimum conditions of growth. The uses of machines for sowing of different crops reduce time of plantation, cost of labour, and enhance production. Traditional method of seed sowing based on assumptions of seed to seed spacing and depth of placement which is not at all efficient and beside this it requires lot of time and efforts too. As per change in climate farmers are facing one more problem which occurs due to harmful insects and pest. Farmers have to stay alert for fighting to this problem by using different fertilizer. Fertilizer is one of the common operation in agriculture field which requires lots of efforts. Placement of seed s through machine also places fertilizers at proper depth to harvest it is better efficiency (Ramesh and Kumar, 2014).

The depth of sowing of chickpea is more important as sowing of seed at proper depth under low rainfall situations reduces the risk of poor crop establishment (Gupta and Singh, 2012).Due to very less or negligible rainfall during the October-December months moisture conservation and sowing depth is important for sowing of *rabi* crops (Gupta *et al.*, 2014), hence mechanized sowing can judiciously use the conserved/available soil moisture.

In the present era of limited land and other resources, mechanization is much needed to increase production and productivity of rainfed crops. Tools are available to implement mechanization in rainfed agriculture for small farmers and thereby increasing their productivity and profitability and at the same time improve sustainability of their livelihoods.

Multicrop seed drill is a very good option for farmers to sow the different crops along with fertilizers in one go. Therefore, the present experiment has been proposed to evaluate the Multi Crop seed Drill in rainfed area of Jammu and its comparison with farmers' practice with the objectives to assess the impact of mechanized planting on growth and yield of different *rabi* crop and work out the relative economics of different planting methods

MATERIALS AND METHODS

Field experiment was conducted during *rabi* 2018-19 at Research Farm, Advanced Centre for Rainfed Agriculture (ACRA), RakhDhiansar, SKUAST-Jammu, J&K UT (32° 39" N 74° 53" E, 332 m amsl) under rainfed conditions. The analysis of soil samples indicated that the soil of the soil of experimental field was *Inceptisols* having sandy loam texture with low available nitrogen, medium phosphorus, low potash with *p*H value 6.58 and low organic carbon. The climate of the region represents sub-tropical conditions characterized by hot and dry summer, cold and dry winter and humid *monsoon*. The climate of the region is characterized by hot summers and temperature sometimes higher than 45ºC in the months of May/June with sufficient but erratic rainfall, high solar radiation and high evapotranspiration. Weather data was recorded at Meteorological Observatory, ACRA, RakhDhiansar. The winter season receive rainfall through western disturbances from October to March-April. The normal mean annual rainfall of the region is about 1120 mm of which more than 80% received in rainy season (June-September) and rest in winter, pre and post *monsoon* season.

Treatment details

The experiment comprised of main factor methods of planting and sub factor crops. Under methods of planting three methods *viz.*, Multi crop seed drill (P_1), recommended practice (line sowing) (P_2) and farmers' practice (P_3).Under sub-factor, four *rabi* crops *viz.*, wheat, mustard, chickpea and pea which were planted under all the three methods. Total treatment combinations were twelve with three replications. The size of the plots was 6 x 4 m and the design was factorial randomized block design.

Wheat crop was sown at 20 cm spacing whereas chickpea, pea and mustard were sown at 30 x 10 cm spacing. All the crops were sown simultaneously sown all the three methods. Whereas, under farmers; practice all the crops were sown with broadcasting method. Urea, DAP and MoP were used as a source of nitrogen, phosphorus and potassium, respectively. The fertilizers were applied to the different *rabi* crops as per the package and practices of SKUAST-Jammu. The different crops were harvested in the months April/May as per their respective physiological maturity.

RESULTS AND DISCUSSION

Sowing of different *Rabi* crops with multi crop seed drill was very beneficial as the grain and stover/straw yield and harvest index of all the crops were significantly higher when planted with this machine which was followed by sowing with recommended practice (line sowing) and farmers' practice. The reason behind the significant higher yield attained with sowing of crops with multi crop seed drill might be due to the availability of optimum environmental conditions, proper moisture which is the main requisite under rainfed conditions for growth and development of the various *rabi* crops which could have enhanced accumulation of photosynthesis from source to sink and resulted in higher grain and straw/stover yields. The optimum dose of fertilizers applied to the *rabi* crops also aided in the proper and better development of the crops and thus resulted in significantly higher grain and straw/stover yield over recommended practice and farmers' practice. Singh, 2006 also envisage the higher yield of *rabi* crops through mechanization (Table 1 and 2).

Statistically lower grain and straw/stover yield and harvest index of all the crops were observed in farmers practice. The reason behind the lower yield might be the broadcasting method adopted by the farmers which couldn't provide the optimum conditions like proper moisture and unavailability to the applied fertilizers. Also the farmers in rainfed area do not apply the required amount of fertilizers needed for the crops like wheat, chickpea, mustard and pea (Table 1 and 2).

Table-1: Yield (kg/ha) and harvest index of different *rabi* crops under various planting methods

Treatments	Grain Yield (kg/ha)	Straw/Stover Yield (kg/ha)	Harvest index (%)
Multi crop seed drill (Wheat)	3295	9552	34.5
Multi crop seed drill (Mustard)	849	3931	21.7
Multi crop seed drill (Chickpea)	737	2583	28.5
Multi crop seed drill (Pea)	602	2333	25.8
Line sowing (Wheat)	3061	8975	34.1
Line sowing (Mustard)	793	3760	21.3
Line sowing (Chickpea)	688	2483	27.8
Line sowing (Pea)	575	2286	25.1
Farmer's practice (Wheat)	2635	8604	30.6
Farmer's practice (Mustard)	610	3099	19.7
Farmer's practice (Chickpea)	521	2141	24.4
Farmer's practice (Pea)	471	2080	22.6

Table- 2: Effect of different planting methods on yield and harvest index of various *Rabi* crops

Treatments	Grain Yield (kg/ha)	Straw/Stover Yield (kg/ha)	Harvest index (%)
Planting methods (Main Factor)			
Multi crop seed drill	1371	4600	27.6
Line sowing	1280	4376	27.1
Farmer's practice	1059	3981	24.3
CD (5%)	87.5	257.0	0.96
Crops (Sub Factor)			
Wheat	2997	9044	33.1
Mustard	751	3597	20.9
Chickpea	649	2402	26.9
Pea	550	2233	24.5
CD (5%)	100.9	296.9	1.11
Interaction (A X B)	NS	NS	NS

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