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STUDIES ON PRECISION SEEDING COMPARE TRADITIONAL SEEDING IN WHEAT

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Abstract: Field experiments were conducted during the *rabi 2006-07* and *2007-08* to evaluate the possibility of broadcasting manually, seeding with ordinary seed drill, Zero seed drill and CIAE precision seed drill management practices on yield attributes, yield and soil properties of wheat on under irrigated conditions of western U.P. Application of precision seed drill had significantly than other treatments in comparison, there by resulting increase in growth and yield attributes *viz.* plant height, No. of tillers/plant, No. of grains per spike, Straw yield, Grain yield, Biological yield and harvest index of wheat.
Keywords: Wheat; precision seeding; yield.

INTRODUCTION

Amount of seeds in rows in an important factor in crop production, which can affect growth and yield and this to a great extent, depends on the performance of the metering mechanism of the precision seed drill. Therefore, proper design of a metering device is an essential element for satisfactory performance of a precision seed drill. Irregularity of placement of seeds in an index of estimation of seeding quality sown by precision seed drill. Determination of irregularity of seed deposition in the field is very difficult. For a seed drill, the operator has no chance to see the workability of the metering mechanisms. A suitable device is therefore needed to indicate flow in the seed delivery tube of a precision seed drill to continuously indicate the workability of the metering mechanisms. Estimation of cereal-crop production is considered a priority in most research programs (Steinmetz et al., 1990) due to the relevance of food grain to world agricultural production (Rudorff et al., 1996). Crop monitoring and yield forecasting can be done with models that range from statistical to mechanistic with a high number of input variables (Ridao et al., 1998). However, under no optimal growing conditions, estimates of crop growth and yield using crop growth models often are inaccurate (Clevers, 1997).

A Study has assessed the effects of N availability on canopy spectral reflectance measurements. Nitrogen limitation is known to promote decreased chlorophyll content

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(Moorby and Besford, 1983; Peñuelas et al., 1994). When there is a severe N limitation, plants reflect more on the red spectral region as a consequence of this lower chlorophyll content. Thus, under N stress (chlorosis), VI confound the changes in soil cover and plant density with changes in vegetation color (Steven et al., 1990) Seed is a critical input in agriculture contributing 15-20 % towards sink. During recent years, much emphasis is being laid on improving the resource use efficiency both natural as well as externally applied critical inputs like seeds, fertilizers etc. Placement of seeds at proper depth with adequate amount of nutrient, moisture and aeration, accelerates an array of biological activities in soil leading to proper germination and subsequent growth of plants. These processes, in turn, reflect the crop yield. One of the objectives of precision farming is to improve the resource use efficiency of critical inputs like seed, fertilizer, and irrigation water and plant protection chemicals. Various implements are available for sowing of wheat seeds, which are mostly location specific and have been designed to suit the local needs. In the present investigation, an effort has been made to compare the efficiency of various seeding techniques as mediated by manual sowing (broadcasting), ordinary seed drill, zero seed drill and precision seed drill. Data on crop growth yield and soil fertility at periodic intervals was recorded.

MATERIALS AND METHODS

A field experiment was conducted at the research farm, PDFSR Modipuram, Meerut during the *rabi 2006-07* and *2007-08*. The soil of the experimental field was sandy loam in texture, slightly alkaline in reaction, low in organic carbon (0.38%) and available nitrogen (240 kg/ha) and was medium in available phosphorus (13.9 kg/ha) and potassium (262.2 kg/ha). Wheat variety PBW 226 was sown with recommended N, P, K and agronomical practices and harvested during the mid April both the years of experimentation using 120 kg seed ha^{-1}. The experiment of 12 treatments of broadcasting manually, seeding with ordinary seed drill, Zero seed drill and CIAE precision seed drill using 120 kg seed ha^{-1}.

RESULTS

The performance of precision seed drill resulted Grain yield of wheat (4.84 t ha^{-1}) was increased significantly compared to all other methods of seeding. The lowest yield (3.86 t ha^{-1}) was recorded under broadcasting technique (**Table 1**). In comparison to broadcasting technique of seeding, the yield performance under precision plot drill was highest (25.4%) followed by zero till drill (11.9%) and ordinary seed drill (6.2 %). The significant yield advantage under precision seeding was attributed mainly due to proper seed placement. This was further reflected in use efficiency of applied N and also water productivity under this treatment. Water and nitrogen use efficiencies under this treatment were also highest being 1.13 g grain /lit of water and 40.33 kg grain per kg of nitrogen (**Table 2**). The efficiency of zero till drill was second best followed by ordinary drill, which provides same spacing as those of precision plot drill.

Effect on soil properties

There are numerous reports that the soil fertility status monitored at various phonological stages of the crop revealed that, organic carbon of soil did not varied significantly under all the seeding techniques, but available N, P and K status at later growth stages was improved under precision seeding which was on par with zero-till seeding (**Table 3&4**).

CONCLUSIONS

It has been widely reported that precision seed drill on the soil surface has many benefits. It conserves soil moisture, moderates temperature, suppresses weeds, improves soil physicochemical properties and helps make the system sustainable. The results from Western UP, both in research station experiments in fields, show similar or slightly higher yields with precision seed drill. The developed precision could sense the number of grains dropped, ie, the grain seed flow for wheat. The maximum difference between the number of grain seeds dropped on the greased belt and that indicated in the display unit was within 18% for wheat seeds.

Table 1: Effect of improved agricultural implements on growth and yield of wheat

Treatment	Plant height (cm)	No. of tillers m^{-2}	Ear length (cm)	No. of grains per spike	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
T1	88.9	335.3	8.2	37.2	3.86	6.86	10.72	36.01
T2	91.9	370.0	9.2	39.1	4.10	7.05	11.15	36.77
T3	104.1	421.7	9.9	50.3	4.84	7.91	12.75	37.96
T4	89.7	390.3	9.4	47.9	4.32	6.98	11.30	38.23
SEm±	2.1	6.8	0.2	2.1	0.12	0.23	0.57	0.58
CD (P=0.05)	7.1	23.3	0.8	7.2	0.42	0.79	1.97	1.99

Table 2: Effect of seeding techniques on water and N use efficiency in wheat

Treatment	Total water use (ha cm)	Grain yield (t/ha)	WUE (g grain/lit water)	NUE (kg grain /kg N)
BC	43	3.86	0.90	32.17
OD	43	4.10	0.95	34.17
PD	43	4.84	1.13	40.33
ZTD	43	4.32	1.00	36.00
CD (P=0.05)	NS	0.42	NS	NS

Note: 5 irrigations each at 8.6 cm

T1: Broadcasting, T2: Ordinary drill, T3: Precision drill, T4: Zero till drill

Table 3: Changes in SOC and Available N as influenced by seeding techniques at various growth stages of wheat

Treatment	Organic carbon (%)			Available N (kg ha^{-1})		
	CRI	Grand growth	Harvest	CRI	Grand growth	Harvest
	0-15 cm	0-15 cm	0-15cm	0-15cm	0-15cm	0-15cm
T1	0.70	0.69	0.69	156.6	169.2	160.9
T2	0.70	0.69	0.69	154.6	169.4	163.0
T3	0.73	0.61	0.61	160.9	173.2	163.0
T4	0.75	0.62	0.69	158.8	165.5	157.2
SEm±	0.03	0.03	0.03	2.4	1.8	1.3
CD (P=0.05)	NS	NS	NS	NS	6.2	4.6

T1: Broadcasting, T2: Ordinary drill, T3: Precision drill, T4: Zero till drill

Table 4: Changes in available P and K as influenced by seeding techniques at various growth stages of wheat

Treatment	Available P (kg ha^{-1})			Available K (kg ha^{-1})		
	CRI	Grand growth	Harvest	CRI	Grand growth	Harvest
	0-15 cm	0-15 cm	0-15cm	0-15cm	0-15cm	0-15cm
T1	13.5	12.1	10.7	207.4	191.6	167.5
T2	14.2	13.0	9.8	208.6	193.3	170.9
T3	14.3	13.0	10.4	196.5	213.1	169.8
T4	12.5	10.8	9.7	224.1	231.1	165.8
SEm±	0.8	0.4	0.2	9.7	3.4	3.0
CD (P=0.05)	NS	1.3	0.5	NS	11.7	10.1

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