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## Effect of FYM, methods of sowing and seed treatment on growth, yield attributes, yield and net return of late sown wheat (*Triticum aestivum* L.)

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### Abstract

A field experiment was conducted during revision of 2018-19 and 2019-20 at Students' Instructional Farm CSA University of Agriculture and Technology, Kanpur with a view to find out the effect of FYM, methods of sowing and seed treatment on growth, yield attributes, yield and net income of late sown wheat. The 18 treatment combination were tested in split plot design with 3 replication on the basis of 2 years experiment result it was revealed that regarding the methods of sowing significantly better growth viz. plant population at 60 days ( $481.968 \text{ m}^{-2}$ ), yield attributes viz. number of ear head ( $450.500 \text{ m}^{-2}$ ), grain yield ( $39.499 \text{ q ha}^{-1}$ ) and net return ( $52,085 \text{ ₹}$ ) was received in criss-cross sowing method followed by line sowing method plant population at 60 DAS ( $460.732 \text{ m}^{-2}$ ), number of ear head ( $432.943 \text{ m}^{-2}$ ), grain yield ( $37.307 \text{ q ha}^{-1}$ ) and net return ( $57,578 \text{ ₹}$ ) while the minimum plant population at 60 DAS ( $433.187 \text{ m}^{-2}$ ), number of ear head ( $413.503 \text{ m}^{-2}$ ), grain yield ( $34.128 \text{ q ha}^{-1}$ ) and net return ( $39,147 \text{ ₹}$ ) was in broadcasting method. Under nutrient management RDF + 10 t FYM  $\text{ha}^{-1}$  proved that significantly better growth plant population at 60 DAS ( $483.89 \text{ m}^{-2}$ ), number of ear head ( $445.35 \text{ m}^{-2}$ ), grain yield ( $38.81 \text{ q ha}^{-1}$ ) and net return ( $47,966 \text{ ₹}$ ) while the lowest plant population at 60 DAS ( $4465.75 \text{ m}^{-2}$ ), number of ear head ( $419.289 \text{ m}^{-2}$ ), grain yield ( $35.137 \text{ q ha}^{-1}$ ) and net return ( $44,574 \text{ ₹}$ ) was in RDF alone. In case of seed treatment with 0.5% Zn solution was significantly highest plant population at 60 DAS ( $490.933 \text{ m}^{-2}$ ), number of ear head ( $455.877 \text{ m}^{-2}$ ), grain yield ( $39.762 \text{ q ha}^{-1}$ ) and net return ( $52,517 \text{ ₹}$ ) followed by water soaked seed but the minimum plant population at 60 DAS ( $432.697 \text{ m}^{-2}$ ), number of ear head ( $412.913 \text{ m}^{-2}$ ), grain yield ( $34.542 \text{ q ha}^{-1}$ ) and net return ( $40,833 \text{ ₹}$ ) was in dry seed.

**Keywords:** FYM, Late sown wheat, Methods of sowing and Seed treatment

### Introduction

Wheat (*Triticum aestivum* L.) is one of the most important food crop of the world which grown ancient time in the world and known as “King of Cereals” belong to the family Poaceae. In India, wheat is the second most important cereal crop next only to rice and a key crop of the green revolution in post green revolution era. India stand second among the wheat producing countries after China. It is the most important staple food of about 2 billion people (36% of the world population). World-wide, wheat produce nearly 55% of the carbohydrates and 20% of the food calories consumed globally. Today our country enjoys states of surplus in the wheat production against the shortage at the time of independence. But inspite of impressive achievement in the recent past, concerted effort are still needed for achieving sustained growth in production to full fill nutritional requirement of increasing population, maintaining buffer stock for food security and adequate supplies to wheat based food processing industry. Thus we have to increase the production and productivity to full fill food demand. Due to continuous use of huge amount of synthetic chemical fertilizers without use of organic sources and intensive system of cultivation practices, there is change in soil physio-chemical condition, biological properties of soil and nutritional deficiencies are common in general and specifically with micronutrients which are very essential for plants. In this endeavour proper blend of organic and inorganic fertilizers is important not only for increasing yield but also for sustaining soil health, when wheat is sown in the month of December there is a drastic reduction in yield November onwards delay in sowing by each day causes reduction of 41.6 Kg in north-western plain and 5 kg per day per hectare in north-eastern plain of country. In spite of the development of the best production technology late sown usually results. In a poor stand as well as the inadequate vegetative growth of the crop.

## Materials and Methods

A field experiment was conducted during rabi season 2018-19 and 2019-20 at Student Instructional Farm CSA University of Agriculture and Technology, Kanpur (U.P.) having sandy loam soil low in available N (211.5 kg ha<sup>-1</sup>), medium in available P (15.68 kg ha<sup>-1</sup>) and K (232.3 kg ha<sup>-1</sup>) with pH (7.5). The experiment was carried out in split plot design with 3 replication of 18 treatment combination. The main plot consisted of 3 methods of sowing viz. broadcasting, line sowing and criss-cross sowing. The sub-plot consisted nutrient management viz. RDF 100% alone and RDF 100% + 10 tons FYM ha<sup>-1</sup>. The sub-subplot consisted 3 seed treatment viz. dry seed, water soaked seed and seed soaked with 0.5% Zn solution. Wheat var. (K-9423 Unnat Halna) was sown 20 cm apart and per treatment sowing method with seed rate of 125 kg ha<sup>-1</sup> treated as per treatment. The crop received uniform recommended dose of fertilizer @ 100 kg N, 60 kg P and 40 kg K ha<sup>-1</sup> in all treatments along with 10 tons FYM ha<sup>-1</sup> was also applied as per treatment. Half dose of N and full dose of P and K there apply as basal dose at the time of sowing. The remaining N was applied after first irrigation at crown root initiation (CRI Stage). The observations were recorded as per objectives for study the crop was harvested on proper maturity in both the years.

## Result and Discussion

### Growth and Yield Attributes of Wheat

Methods of sowing significantly influenced the plant population at 60 DAS, number of ear head (m<sup>-2</sup>), number of grains ear<sup>-1</sup>, grain weight ear<sup>-1</sup> and test weight (g) (Table 1). The criss-cross sowing methods showed the significantly

highest number of plant (488.715 m<sup>-2</sup>), number of ear head (450.5 m<sup>-2</sup>), number of grains ear<sup>-1</sup> (47.461), grain weight ear<sup>-1</sup> (2.558 gm) and test weight (37.662 gm) followed by line sowing method plant population at 60 DAS (460.732 m<sup>-2</sup>), number of ear head 432.943 m<sup>-2</sup>, number of grains ear<sup>-1</sup> (44.944), grain weight ear<sup>-1</sup> (2.422 gm) and test weight (36.891 gm) while the minimum was recorded the number of plant population (433.187m<sup>-2</sup>), number of ear head 413.5 m<sup>-2</sup>, number of grains ear<sup>-1</sup> (40.926), grain weight ear<sup>-1</sup> (2.208 gm) and test weight (36.067 gm) in broadcasting method.

Under nutrient management practices RDF + 10 tons FYM ha<sup>-1</sup> gave significantly better plant population (483.994 m<sup>-2</sup>), number of ear head (445.352 m<sup>-2</sup>), number of grains ear<sup>-1</sup> (36.368), grain weight ear<sup>-1</sup> (2.499 gm) and test weight (37.384 gm) while the lowest was recorded plant population (466.750 m<sup>-2</sup>), number of ear head (419.289 m<sup>-2</sup>), number of grains ear<sup>-1</sup> (42.519), grain weight ear<sup>-1</sup> (2.292gm) and test weight (36.362 gm) in RDF alone.

Regarding seed treatment significantly highest plant population (490.933 m<sup>-2</sup>), number of ear head (455.877 m<sup>-2</sup>), number of grains ear<sup>-1</sup> (47.777), grain weight ear<sup>-1</sup> (2.578 gm) and test weight (37.762 gm) was recorded in seed soaked with 0.5% Zn solution followed by water soaked seed number of plant population (462.337 m<sup>-2</sup>), number of ear head (428.158 m<sup>-2</sup>), number of grains ear<sup>-1</sup> (44.089), grain weight ear<sup>-1</sup> (2.373 gm) and test weight (37.119 gm) while the minimum number of plant population (432.697 m<sup>-2</sup>), number of ear head (412.913 m<sup>-2</sup>), number of grains ear<sup>-1</sup> (41.465), grain weight ear<sup>-1</sup> (2.235 gm) and test weight (35.663 gm) was received in dry seed.

**Table 1:** Effect of FYM, Method of sowing and Seed treatment treatments on growth and yield attributes of late sown wheat

Treatments	Plant Population at 60 DAS (m <sup>-2</sup> )	Number of ear head (m <sup>-2</sup> )	Number of grains ear <sup>-1</sup>	Grain weight ear <sup>-1</sup> (g)	Test weight (g)
<b>Main Plots (Methods of Sowing)</b>					
M1- Broadcasting	433.187	413.503	40.926	2.208	36.067
M2- Line sowing	460.732	432.943	44.944	2.422	36.891
M3- Criss-cross sowing	488.715	450.500	47.461	2.558	37.662
S.E(d)±	4.915	3.680	0.586	0.031	0.193
CD at (5%)	13.645	9.004	1.351	0.071	0.445
<b>Sub-Plot (Nutrient Management)</b>					
F <sub>1</sub> - RDF (100:60:40 kg N.P.K. ha <sup>-1</sup> )	446.750	419.279	42.519	2.292	36.362
F <sub>2</sub> - RDF + 10 tons FYM ha <sup>-1</sup>	483.894	445.352	46.368	2.499	37.384
S.E(d)±	3.780	2.834	0.407	0.017	0.142
CD at (5%)	9.251	6.175	0.886	0.038	0.308
<b>Sub-sub plot treatments (Seed treatments)</b>					
S <sub>1</sub> - Dry seed	432.697	412.913	41.465	2.235	35.663
S <sub>2</sub> - Water-soaked seed	462.337	428.158	44.089	2.373	37.194
S <sub>3</sub> - Seed-soaked with 0.5% Zn solution	490.933	455.877	47.777	2.578	37.762
S.E(d)±	4.969	3.575	0.551	0.026	0.180
CD at (5%)	10.255	7.193	1.109	0.052	0.362

### Yield and Economics

Grain yield (q ha<sup>-1</sup>), straw yield (q ha<sup>-1</sup>), gross return (₹), net return (₹) and B: C ratio was influenced significantly due to different methods of sowing, nutrient management and seed treatment (Table 2). The criss-cross sowing method showed significantly highest grain yield (39.499 q ha<sup>-1</sup>), straw yield (63.053 q ha<sup>-1</sup>), gross return (93,129 ₹), net return (52,058 ₹) and B: C ratio (2.267) as compare to other methods of sowing. The line sowing method was also gave significantly higher grain yield (37.307 q ha<sup>-1</sup>), straw yield (60.673 q ha<sup>-1</sup>), gross return (88,122 ₹), net return (47,578 ₹) and B: C ratio (2.149) while the minimum grain yield (34.128 q ha<sup>-1</sup>), straw

yield (56.405 q ha<sup>-1</sup>), gross return (81,248 ₹), net return (39,174 ₹) and B: C ratio (1.927) was received in broadcasting method.

Under nutrient management practices RDF + 10 tons FYM ha<sup>-1</sup> gave significantly higher grain yield (38.819 q ha<sup>-1</sup>), straw yield (62.440 q ha<sup>-1</sup>), gross return (91,707 ₹), net return (47,966 ₹) and B: C ratio (2.085) over RDF alone grain yield (35.137 q ha<sup>-1</sup>), straw yield (57.648 q ha<sup>-1</sup>), gross return (83,292 ₹), net return (44,574 ₹) and B: C ratio (2.143).

In case of seed treatment seed treated with 0.5% Zn solution produced significantly highest grain yield (39.762 q ha<sup>-1</sup>), straw yield (63.408 q ha<sup>-1</sup>), gross return (93,532 ₹), net return

(52,517 ₹) and B: C ratio (2.257) over rest of the treatments. Water soaked seed was also capable to produced significantly better grain yield (36.630 q ha<sup>-1</sup>), straw yield (59.776 q ha<sup>-1</sup>), gross return (86,798 ₹), net return (45,461 ₹) and B: C ratio

(2.099) while the minimum grain yield (34.542 q ha<sup>-1</sup>), straw yield (57.148 q ha<sup>-1</sup>), gross return (82,169 ₹), net return (40,833 ₹) and B: C ratio (1.986) was obtained in dry seed.

**Table 2:** Effect of FYM, Method of sowing and Seed treatment treatments on yield and economics of late sown wheat

Treatments	Grain Yield (q ha <sup>-1</sup> )	Straw Yield (q ha <sup>-1</sup> )	Gross Return (₹)	Net Return (₹)	B: C ratio
<b>Main Plots (Methods of Sowing)</b>					
M1- Broadcasting	34.12	56.40	81248	39177	1.92
M2- Line sowing	37.30	60.67	88122	47578	2.14
M3- Criss-cross sowing	39.49	63.05	93129	52058	2.26
S.E(d)±	0.52	1.07	745.9	503.60	0.01
CD at (5%)	1.21	2.48	1720.20	1161.20	0.03
<b>Sub-Plot (Nutrient Management)</b>					
F <sub>1</sub> - RDF (100:60:40 kg N.P.K. ha <sup>-1</sup> )	35.13	57.64	83292	44574	2/14
F <sub>2</sub> - RDF + 10 tons FYM ha <sup>-1</sup>	38.81	62.44	91707	47966	2.08
S.E(d)±	0.38	0.56	600.30	387.80	0.01
CD at (5%)	0.83	1.24	1308.10	844.90	0.02
<b>Sub-sub plot treatments (Seed treatments)</b>					
S <sub>1</sub> - Dry seed	34.54	57.14	82169	40833	1.98
S <sub>2</sub> - Water-soaked seed	36.63	59.57	86798	45461	2.09
S <sub>3</sub> - Seed-soaked with 0.5% Zn solution	39.76	63.40	93532	52517	2.25
S.E(d)±	0.60	0.69	711.50	489.40	0.01
CD at (5%)	1.21	1.40	1431.50	984.60	0.02

### Interaction Effect

Interaction effect of methods of sowing, nutrient management and seed treatment was not found significant in case of plant population at 60 DAS, number of ear head (m<sup>-2</sup>), number of grains ear<sup>-1</sup>, grain weight ear<sup>-1</sup> and test weight (g), grain yield (q ha<sup>-1</sup>), straw yield (q ha<sup>-1</sup>), gross return (₹), net return (₹) and B: C ratio while the highest was recorded in the combination of criss-cross sowing method along with RDF + 10 tons FYM ha<sup>-1</sup> and seed soaked with 0.5% Zn solution.

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