

Study on aimed to explore the impact of different wheat varieties and sowing methods on the growth and yield of Wheat (*Triticum aestivum* L.)

Raghvendra Singh, Aneeta Yadav, Durgesh Kumar Maurya, Ravikesh Kumar Pal,
Jitendra kumar, Arun Shankar and Rajesh Pal

Faculty of Agricultural Sciences and Allied Industries, Rama University, Mandhana, Kanpur,
U.P. 209217

ABSTRACT

A research investigation was conducted during the Rabi season of 2020-21 at the Agricultural Farm of Rama University, Kanpur, Uttar Pradesh, India. Study on aimed to explore the impact of different wheat varieties and sowing methods on the growth and yield of Wheat (*Triticum aestivum* L.). The experimental design employed a factorial randomized block layout with 12 treatment combinations, replicated three times. The first factor comprised four wheat cultivars: V1 (NW-5054), V2 (NW-4018), V3 (K-1006), and V4 (K-8804). The second factor included three sowing methods: M1 (Broadcasting), M2 (Line Sowing), and M3 (Raised Bed methods). Notably, the variety K-1004, sown using the raised bed method. Furthermore, Variety K-1004, sown using the raised bed method, demonstrated higher grain yield, straw yield, harvest index, and B:C ratio. The same sowing method with Variety NW-5054 also yielded favorable results, though slightly lower than K-1004. In summary, the research findings suggest that for optimal growth and yield of wheat, particularly in terms of net monetary income and B:C ratio, the choice of Variety K-1004 and the raised bed sowing method is recommended.

Key words: Yields q/ha, straw yield q/ha and biological yield q/ha harvest index as well as gross return, net return and b:c ratio of wheat

Introction

Wheat (*Triticum aestivum* L.) have a place with family Poaceae is one of the main cereal harvest of the world that has been considered as basic part of food security arrangement of a few countries of the world. Wheat rank first in the world among the all cereals in respect of area (217.06 million hectare) and production (764.49 million metric tonnes) during the year 2019-20

(Anonymous, 2020, b). In India total area under wheat cultivation is 31.04 million hectare, with the production of 117.5 million tonnes during the year 2019-20 (Anonymous, 2020, a). Wheat have more nutritional quality when contrasted with different cereals. It has great nourishment profile with 12.1 % .protein, 1.8 % lipids, 1.8 % debris, 2.0 % decreasing sugars, 6.7 % pentose and gives 314 Kcal/100g of food. Wheat is additionally a decent wellspring of minerals and nutrients viz., calcium (37 mg/100g), iron (4.1mg/100g), thiamine (0.45mg/100g), riboflavin (0.13mg/100g) and nicotinic corrosive (5.4mg/100mg). Not at all like different oats, has wheat contained a high measure of gluten, the protein that gives the flexibility important to great bread making. Hard wheat is high in protein (10-17%) and yields a flour wealthy in gluten, making it especially reasonable for yeast breads.

Wheat area is shrinking every year, with very limited room for expansion in the future. As a result, a vertical increase in yield per acre is urgently needed to ensure household food security. It should be highlighted, however, that present climate change effects on wheat are equivocal and model dependent. (Tubiello *et al.* 2000). Recent and extensive research on the consequences of climate change anticipates significant increases in both rainfall and temperature, with temperatures in South Asia rising by as much as 3-4°C by the end of the century (DEFRA, 2005). Reduced grain yield is one of the predicted effects on wheat output over much of India, with the biggest implications in low-potential areas, such as the eastern plains. In fact, seed broadcasting has become a highly popular method of sowing among farmers these days. In terms of wheat grain yield, the traditional broadcast approach was found to be inferior to other sowing methods.

In agronomical research, the major emphasis should be laid in quantification of yield advantages of various sowing methods over traditional sowing method and how far the yield advantage can be explained in agronomical terms reflecting in the improvement of plant population or in per plant yield or both. To fully exploit the potential of high yielding varieties, the development of special non-monetary management practices like sowing methods is a prime need that promotes the efficient utilization of nutrients, water and space, reduces the cost of cultivation, save the seed fertilizers, causes in rouging in the seed production and intercultural operation, better control of seeds, insect pest, and diseases.

MATERIALS AND METHODS:

The present investigation entitled “The study aimed to explore the impact of different wheat varieties and sowing methods on the growth and yield of Wheat (*Triticum aestivum* L.)” the field experiment was carried out during rabi season of 2021-22. The climatic conditions under which the experiment was conducted and the materials adopted in the present investigation are described as follows:

Experimental Sites and Geographical Situation

The experiment was conducted at central region of Uttar Pradesh in Kanpur Nagar. The soil is alluvial with slightly sodic in nature due to lower terrain region. Kanpur (U.P.) situated at 25° 56’ to 28° 58’ North and longitude 79° 31’ to 80° 34’ East and is located on an elevation of about 125.9 meters above mean sea level in Gangetic plain. The experimental farm falls under the Indo-Gangetic alluvial tract and irrigated by tube well. The experiment was conducted on the farm of the university using Factorial Randomized Blok Design (FRBD) having three replications and twelve treatments combination.

Varieties under Study:**Narendra Wheat 5054**

The variety had high yielding ability under optimum planting conditions and has also shown flexibility for planting under late sown conditions up to mid- December. This variety has waxiness, pre-harvest sprouting tolerance and thus suitable for east and far eastern regions of the country.

Narendra Wheat -4018

NW 4018 is recommended timely sown, rainfed condition of Uttar Pradesh. It matures in 125 days and has plant height of 80 cm; possesses resistance to rust and has good yield in alkaline and saline soils.

K-1006

K 1006 has erect leaf, non- synchronous tillering and bold grain thus making it suitable for cultivation in eastern India under normal planting situations and also has flexibility for late

sowing. This variety has high protein, good chapatti making quality and high loaf volume and thus suitable for different end products.

K-8804

K 8804 is recommended timely sown, rainfed condition of Uttar Pradesh. Mostly grown in Bihar, eastern Uttar Pradesh, West Bengal, Orissa, Assam, Jharkhand and plains of north-eastern states.

Productivity Parameters:

Grain Yield (q ha⁻¹)

After taking the weight of total biomass, the produce of each net plot was threshed separated manually. The grains of each plot were cleaned and air dried to maintain the moisture content at standard level of 14 % and recorded the weight in kg per net plot by balance. Finally grain yield per plot was converted in to q ha⁻¹ by conversion factor.

Straw Yield (q ha⁻¹)

Straw yield was recorded by subtracting the weight of grains from the weight of total harvested produced of each net plot. Thus the straw yield obtained in kg per plot was multiplied with the conversion factor in order to get straw yield in q ha⁻¹.

Biological Yield (q ha⁻¹)

The biological yield was obtained at harvest from each plot by taking bundle weight and recorded as kilogram per plot. This was converted into q ha⁻¹ by multiplying factor for statistical analysis.

Harvest Index (%)

The harvest index was worked out with the help of following formula:

$$\text{Harvest Index(\%)} = \text{Seed yield (q ha}^{-1}\text{)} / \text{Biological yield (q ha}^{-1}\text{)} \times 100$$

Economics

Cost of cultivation (₹ ha⁻¹):

Cost of cultivation of different treatments was worked out by considering all the expenses incurred in the cultivation of experimental crop and added with cost due to various operations and inputs used. Accordingly cost of cultivation

was calculated for each treatment combinations.

Gross return (₹ ha-1):

Gross return was worked out by multiplying grain and straw yield separately under various treatment combinations with their existing market price. The money value of grain and straw was added together in order to achieve gross return.

Net returns (₹ ha-1):

Net return was calculated by deducting the cost of cultivation from the gross return of the individual treatment combination.

Net return = Gross return – Cost of cultivation Benefit-cost ratio (₹/re invested):

Benefit-cost ratio was worked out by dividing the net return to the cost of cultivation of the individual treatment combination.

Benefit-cost ratio = Net Return (₹ ha-1)/Cost of cultivation (₹ ha-1)**RESULTS AND DISCUSSION:-**

Biological yield was affected significantly by different methods of sowing. The higher values of biological yield were obtained under raised bed sowing. The increase in biological yield might be due to proper development tillers under raised bed sowing method, better uptake and utilization of nutrients and sunlight with least competition among the plants which ultimately reflected on the growth and higher biomass production.

Grain and straw yield were affected significantly due to different methods of sowing during both the years of investigation. Higher yield was recorded under raised bed sowing method which was significantly superior as compared to other sowing methods. Growth in vegetative phase and development in reproductive phase determines the yield. **Tadesse et al. (2017), Pirzada (2018) and Khatri et al. (2019)**

Economics:-

Viability is a function of gain or loss. Any practice in order to be economical viable must have a substantial balance over its cost. In order to assured profitability net return and B: C ratio was worked out. The data revealed that effect of different combination of method of sowing and different cultivars of wheat significantly affect the gross return of wheat crop. The maximum gross return were noted Rs. 111390 in M₃×V₂ interaction while the minimum gross return were noted Rs. 73588 in M₁×V₂ interaction. The maximum B: C Ratio were noted 1.51 in M₃×V₃

interaction. Similar result is reported by **Dagash *et al.* (2014)** and **Khatri *et al.* (2019)**

Summery and Conclusion:-

Significantly the highest grain yield (44.56 q/ha) was recorded with by raised bed method sown crop followed by line sowing and broadcasting sown crop. Wheat variety K-1004 sowing by raised bed method recorded significantly the highest grainyield of 47.56 q/ha. However, the lowest grain yield (31.20 q/ha) being with the variety NW- 4018 sown by broadcasting method. The crop sown by raised bed method produced significantlythe highest straw yield (59.43 q/ha) which was followed by line sowing and broadcasting sown crop. Interaction effect on straw yield, revealed that variety K-1004 sowing by raised bed method produced the maximum straw yield (62.23 q/ha) and the lowest being with the variety NW- 4018 sowing with broadcasting methods(42.88 q/ha). Similar to grain and straw yield, total biological yield was recorded significantly highest (103.99 q/ha) with raised bed sowing crop which was followed by line sowing and broadcasting sown crop. Harvest index was highest (43.19 %) with broadcasting method sown crop followed by raised bed and line sowing methods and being lowest (42.36 %) with line sowing sown crop. The data revealed that effect of different combination of method of sowing and different cultivars of wheat significantly affect the net return of wheat crop. The maximum net return were noted Rs. 67014 in K-1004 sowing by raised bed method while the minimum net return were noted Rs. 31512 in NW- 4018 sowing with broadcasting methods.

Effect of varieties

Significantly the highest grain yield (41.26 q/ha) was recorded with variety K-1004 method sown crop followed by variety K- 8804, NW-5054 and NW-4018. Wheat variety K-1004 sowing by raised bed method recorded significantly the highest grain yield of 47.56 q/ha. However, the lowest grain yield (31.20 q/ha) being with the variety NW- 4018 sown by broadcasting method. Variety K-1004 produced significantly the highest straw yield (54.79 q/ha) which was followed by variety K-8804, NW-5054 and NW-4018. Interaction effect on straw yield, revealed that variety K-1004 sowing by *raised* bed method produced the maximum straw yield (62.23 q/ha) and the lowest being with the variety NW- 4018 sowing with broadcasting methods(42.88 q/ha).

Similar to grain and straw yield, total biological yield was recorded significantly highest (96.05 q/ha) with variety K- 1004 which was followed by variety K-8804, NW-5054 and NW-4018. Harvest index was highest (42.99 %) with variety K-1004 followed by variety K-8804, NW-5054 and NW-4018 and being lowest (42.46 %) with variety NW-5054. The data revealed that effect of different combination of method of sowing and different cultivars of wheat significantly affect the net return of wheat crop. The maximum net return were noted Rs. 67014 in K-1004 sowing by raised bed method while the minimum net return were noted Rs. 31512 in NW- 4018 sowing with broadcasting methods.

CONCLUSION

On the basis of results of present investigation it can be concluded that variety K-1004 have been suitable for eastern plain zone of Uttar Pradesh. If the variety K-1004 have been sown by raised bed sowing method farmers should get more yield in comparison to other sowing methods subsequently gets more profits.

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Table:- 1 Two way mean table of productivity parameters at different method of sowing and different varieties.

Sowing Methods	Varieties				Mean
	V1	V2	V3	V4	
	Grain Yield(q ha ⁻¹)				
M1	34.00	31.20	35.70	34.90	33.95
M2	38.00	47.00	36.80	41.70	40.87
M3	41.50	42.00	47.56	47.18	44.56
Mean	37.83	40.06	40.02	41.26	
Straw Yield(q ha⁻¹)					
M1	43.98	42.88	46.80	44.78	44.61
M2	52.56	60.43	50.53	58.48	55.50
M3	55.31	59.07	62.23	61.12	59.43
Mean	50.61	54.12	53.18	54.79	
Biological Yield(q ha-1)					
M1	77.98	74.08	82.50	79.68	78.56
M2	90.56	107.43	87.33	100.18	96.37
M3	96.81	101.07	109.79	108.30	103.99
Mean	88.45	94.19	93.20	96.05	
Harvest Index (%)					
M1	43.60	42.11	43.27	43.80	43.19
M2	41.96	43.74	42.13	41.62	42.36

M3	42.86	41.55	43.31	43.56	42.82
Mean	42.80	42.46	42.90	42.99	

Table:- 2 Effect of different treatment combinations oneconomics of wheat crop.

S.No.	Treatments	Cost (Rs./ha)	Gross Return (Rs./ha)	Net Return (Rs./ha)	B :C Ratio
1.	M1V1	42076	79505	37429	0.88
2.	M1V2	42076	73588	31512	0.74
3.	M1V3	42076	83635	41559	0.98
4.	M1V4	42076	81518	39442	0.93
5.	M2V1	42876	89710	46834	1.09
6.	M2V2	42876	109812	66936	1.56
7.	M2V3	42876	86784	43908	1.02
8.	M2V4	42876	98645	55769	1.30
9.	M3V1	44376	97450	53074	1.19
10.	M3V2	44376	99397	55021	1.23
11.	M3V3	44376	111390	67014	1.51
12.	M3V4	44376	110347	65971	1.48