

Effect on Economic of Fertilizer Levels with Plant Growth Regulator (GA₃) in Wheat Crop (*Triticum aestivum* L.)

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Abstract – The most important role of nitrogen in the plant is its presences in the structure of protein, nitrogen is also found in chlorophyll, the green colouring matter of leaves. Chlorophyll enables the plant to transfer energy from sunlight by photosynthesis. Next to nitrogen, phosphorus is the most important nutrient needed by a wheat crop for plant development starting when wheat is just a seedling and continuing all the way to maturity. Adequate potassium results in superior quality of the whole plant due to improved efficiency of photosynthesis, increased resistance to some diseases, and greater water use efficiency, stronger wheat straw and assists in grain filling. Plant hormones play a pivotal role in the regulation of plant growth and development. However, their role becomes more crucial under stress because they also act as stress signaling molecules, response determiners, and regulators. Thus, phytohormones are considered the most critical endogenous substances because they regulate many physiological and developmental processes. A field experiment was conducted during 2019-20 to study the effect of different weed control methods and mulching on growth and yield of chickpea at Brahmaand Post Graduate College, Rath district Hamirpur Uttar Pradesh. As a consequence it was found that highest net return and B:C ratio was received with 120:60:40 kg of fertilizer levels and with regards to the PGR it was recorded with 1.0 kg of PGR application.

Keywords – Fertilizer Levels, Gibberlic Acid (PGR), Wheat, Net Profit and B:C Ratio.

I. INTRODUCTION

Wheat (*Triticum spp.* L.) is classify as a main of cereal crop in several parts of the world; it is the 1st widely plant play an important role in the development of civilization, it has the most regularly traded crop of all edible commodities due to it is easy to stores and transport. Moreover, wheat is considered the essential source of carbohydrates and numerous essential nutrients and nutritive fiber contains 12 % protein, 1.72 % fat, 69.60 % carbohydrate and 27.2 % minerals. According to FAO the total cultivated area of wheat in the world reached about 220.10 million ha in 2016 and the total production exceeded about 749.46 million tonne. However, the total cultivated area in India reached about 29.58 million ha and the total production reached about 99.70 million tonne with a productivity of 33.71 q/ha. Uttar Pradesh is the leading producer of wheat occupying area of 9.75 million hectare with a production 31.88 million tone sharing 32.98 percent of total country's production.

An efficient management of fertilizer is an important task to increase wheat yield in India. The effect of balanced nitrogen, phosphorus and potash is more prominent and significant over other fertilizers, as because nitrogen is the integral part of protoplasm, protein and chlorophyll, and results in larger cell size in turn increases plant height and crop yields. Increasing crop yield through adequate fertilization is a pertinent farm management tool. The basic requirement for high yield and quality of wheat is that the plant receives optimum amount of nutrients through the growing season. Therefore, this nutrient is mostly added extraneously in order to supplement their deficiencies in soil for successful crop production.

Per-sowing seed treatments in hormonal substances such as Gibberellic acid (GA₃) significantly have been s-

-hown to increase and encourage the process of seed germination characters and seedling parameters, cell division, hypocotyls growth as well as stand establishment, Gibberellic Acid (GA3) is consider the most important growth regulator, which play a vital role in breaks seed dormancy, encourages germination, intermodal length, hypocotyls growth and cell division and increases the size of leaves. Moreover, GA3 stimulates hydrolytic enzymes that are needed for the degradation of the cells surrounding the radical and thus speeds germination by promoting seedling elongation growth of cereal seeds. Seed soaking can do different methods such as osmopriming, hydropriming, potassium salts, hormones polietylinhlycon, nutritional imbalance, osmotic effects, maximizing nutrient reserves through increased physiological activities, root proliferation and rapid seedling appearance that can product strong plants. However, soil applied fertilizers are often associated with deficiencies of nutrients during periods of critical demands such as reproductive stage as a result of limitations in uptake or restrictions in nutrient delivery [4]. In order to curb the challenge of soil fertility, the majority of wheat farmers use soil applied fertilizer both organic and inorganic to enhance growth and yield. In light of important of wheat and its yield losses owing to less fertility and more stress, a field experiment entitled “Effect of fertilizer levels with plant growth regulator (GA3) in wheat crop (*Triticum aestivum* L.)” during autumn season of 2019-20 at the research farm of Brahmanand Post Graduate College, Rath (Hamirpur) U.P. India, was conducted.

II. MATERIALS AND METHODS

The field experiment was conducted at research farm of Brahmanand Post Graduate College, Rath (Hamirpur) U.P. during winter season of 2019-20 in the subtropical zone at latitude and longitudinal range of 79.70 East and 25.50 North. It is located at an elevation range of 526 feet’s from the mean sea level. The annual rainfall ranges between 875-975 mm, which is received mostly from last week of June to last of September with occasional shower in winter. The soil of the experimental field was Parwa in texture having soil pH 7.6, organic carbon 0.53%, field capacity 17.33 %, permanent wilting point 6.8% and bulk density 1.48 gm/cm³ respectively. The available nitrogen, phosphorous and potassium were 108.8, 24.55 and 123.0 kg per ha⁻¹, respectively. Sixteen combinations of four fertilizer levels (N:P:K) i.e. control, 80:40:20, 100:50:30, and 120:60:40 with four Gibberlic acid level i.e. control, 1 kg-ha, 1.5 kg-ha and 2.0 kg-ha were used for the experiment.

Sowing of seeds of wheat variety PBW-373 was undertaken in the field at crop spacing of 22.5 cm on 20th October 2019. The fertilizer dose of N, P₂O₅ and K₂O was applied as per the treatment given per plot. Full dose of phosphorus and potash and half dose of nitrogen was applied before sowing and remaining half dose of nitrogen was applied after weeding. The Gibberlic acid was applied as seed treatment just before sowing. The data collected from the experiment was analysed statistically using the analysis of variance procedure, appropriate for the factorial randomized block design. The test of significance was carried out at 5 per cent level.

III. RESULTS AND DISCUSSION

Total Cost of Cultivation:

Data presented in table 1 indicate that the maximum (Rs. 62290.65) total cost of cultivation was recorded with 120:60:40 kg of fertilizer application which was Rs. 1668.45, Rs. 3417.47 and Rs. 9428.74 more over 100:50:30, 80:40:20 and control. The highest cost of fertilizer application with 120:60:40 increased due to

highest fertilizer dose and its cost. The minimum (Rs. 52861.91 per ha) total cost of cultivations was recorded with no fertilizer application due to minimum cost incurred in this level of fertilizer application. The results are harmonized with Ghosh et al (2003).

In regards to the PGR (GA3) the maximum (Rs. 59994.53 per ha) total cost of cultivations was calculated with 2.0 kg of PGR application which was Rs. 125.08, Rs. 854.85 and Rs. 4425.24 more over 1.5 kg, 1.0 kg and control, respectively. The minimum (Rs. 55569.29 per ha.) total cost of cultivations was in without application of PGR (GA3), Sobh et al (2000).

Gross Return (Rs/ha)

It is very clear from table 1 and that the maximum gross return (Rs. 153865.00 per ha) was calculated with 120:60:40 fertility level which was increased 30.03 percent more over without application of fertilizers in the trial. Decreasing level of fertilizer also decreased the gross return in this regards.

PGR application in different quantity also differed the total gross return in wheat crop. The highest gross return was calculated with application of 1.5 kg PGR per hectare might be due to optimum dose of PGR to the crop and optimum population of bacteria for proper growth and development of the wheat plant. The minimum gross return (Rs. 13039.68) was calculated with control plot, Bagatharia et al (1998).

Net Return (Rs/ha):

Fertilizer level hugely affected the net return of the wheat crop on the basis calculation in per hectare of trial production. Each increased level of fertilizer up to 120:60:40 surprisingly increased the net return of the crop per hectare. Maximum net return Rs. 91574.35 per hectare was calculated with 120:60:40 kg of fertilizer level which was increased Rs. 4295.36, Rs. 13853.03 and Rs. 46037.70 over 100:50:30, 80:40:20 and control. The 120:60:40 fertilizer level was 50.27 per cent more over the control plot or without application of fertilizer in wheat crop. It is 15.12 percent mover over the lease dose of fertilizer level i.e. 80:40:20 when compared with 120:60:40 kg of fertilizer level. Net profit was increased in each level of increased fertilizer level up to 120:60:40 kg per hectare. The minimum net profit Rs. 45536.65 was calculated with control treatment in the trial.

Doses of PGR in wheat crop also showed drastic change in the net profit of wheat crop. Optimum and economic dose of 1.5 kg PGR per hectare showed best performance in this regards. Highest net profit Rs. 83907.38 was calculated with the application of 1.5 kg of PGR per hectare in wheat crop, it was due to optimum synthesis of plant hormones and synthesis of photosynthates within the plant which was not confer with the application of 1.0 kg and 2.0 kg of PGR per hectare considered as over dose and disturbance in bio synthesis process within the plant. The 1.5 kg PGR per hectare increased 1.48%, 2.60% and surprisingly 12.25 more over 1.0 kg, 2.0 kg and control, respectively. The results are in consonance with Farookh et al (1999).

Benefit/Cost Ratio:

Benefit cost ration is the simple tool to understand the economic practices of any crop. It is evident from table.1 that the maximum 1.46 Benefit/cost ratio was calculated with 120:60:40 fertility level which was 8.50, 0.08 and 0.12 higher as compared to the Benefit/Cost ratio of 100:50:30, 80:40:20 and control fertility level, respectively.

PGR application of 1.5 kg per hectare was found to produce maximum 1.41 Benefit/Cost ratio which was 0.03, 0.03 and 0.12 higher as compared to the Benefit/Cost ratio of 1.0, 2.0 and control, respectively, Farookh et al (1999).

Table 1. Economic value influenced by fertilizer levels and Gibberlic acid.

Treatment	Total Cost of Cultivation (Rs./ha)	Total Gross Return (Rs/ha)	Net Profit (Rs.)	Benefit/ Ratio (B/C Ratio)
Fertilizer Levels				
Control	52861.91	118322.11	45536.65	1.23
80:40:20	58873.18	136594.50	77721.32	1.35
100:50:30	60622.20	147901.18	87278.99	1.43
120:60:40	62290.65	153865.00	91574.35	1.46
Plant Growth Regulators				
Control	55569.29	130319.68	74750.39	1.23
1.0 kg ha ⁻¹	59139.68	143047.06	83907.38	1.41
1.5 kg ha ⁻¹	59994.53	142672.06	82677.54	1.38
2.0 kg ha ⁻¹	59869.45	141644.69	81775.99	1.35

Table 2. Meteorological data.

Standard Meteorological Week		40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13
Temperature (°C)	Max	35.8	34.6	34.8	33.6	32.1	29.4	3.9	3.2	26.5	25.7	22.9	22.8	21.9	23.6	21.2	22.9	21.4	21.5	22	23.5	27.3	23.3	26.4	28	32.2	35.6
	Min	20	18.3	15.9	14.9	14.5	11.1	11.9	11.4	9.8	8.1	7.0	4.8	4.8	5.8	5.1	4.8	8.2	5.9	7.7	9.5	11	9.4	11.7	12.3	14.1	16.4
Relative Humidity (%)	I	80	79	76	75	78	79	83	81	81	78	87	90	91	88	88	90	90	89	89	90	83	89	82	80	75	63
	II	36	36	36	38	43	47	46	44	44	43	46	49	56	48	52	45	55	58	57	45	47	52	44	43	38	33
Rainfall (mm)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12.4	0.4	0	3.2	0	0	0	0
Evaporation (mm)		5.3	5.3	5.3	5.1	4.4	4.4	3.9	3.6	3.6	3.3	0.7	2.7	2.3	2.6	2.4	2.5	2.4	2.5	2.7	2.8	3.8	4	4.4	5	6	7.6

40th Weed- 1st Oct to 7th Oct, 2019 13th week- 25th March to 1st April, 2020.

IV. METEOROLOGICAL OBSERVATIONS

Weather that is comfortable for humans is also good for wheat. Wheat needs 12 to 15 inches (31 to 38 centimeters) of water to produce a good crop. It grows best when temperatures are warm, from 70° to 75° F (21° to 24° C), but not too hot. Wheat also needs a lot of rainfall, especially when the crop in initial growth. During the year (2019-20) the total rainfall was above normal during cropping period, the rainfall from September to February was as high as 16.00 mm which was much lower from normal of 125.50 mm. However proper irrigation facilities were available at research farm and the crop was irrigated as per schedule. During the crop growth period in 2019-20 the lowest and highest mean temperature recorded 5.10C and 35.60C but during the peak growth stage of crop it was not exceeded beyond 280C which is quite favourable for wheat growth.

Relative humidity is one of the most important constraints for wheat growth which must be in the range of 80-90 percent. Highest humidity was recorded in the month of January and February 2020 which was in the range of 88-90 and it is most favourable humidity for the wheat growth. Similar findings were presented by [18].

V. CONCLUSION

The present investigations were carried out with a purpose to assess the adoption of adequate fertilizer level and Gibberlic acid in wheat crop in terms of economic feasibility. The findings of the study are encouraging to adopt application of 120:60:40 (N:P:K) fertilizer level along with the application of Gibberlic acid @ 1.5 kg ha⁻¹ in wheat crop for obtaining net profit.

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