

# Effectiveness of the use of biologically active substances (bas) at different levels of mineral nutrition of beans (*paseolus vulgaris* L.) grown under condition Afghanistan

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**Abstract.** This experiment was carried out in experimental field of Alberoni University of Kapisa province of Afghanistan, in the summer of 2022 and 2023. The experiment was carried out in the form of randomized complete block design with three replications. The treatment included three different levels nitrogen (N<sub>30</sub>, N<sub>45</sub>, N<sub>60</sub>), phosphorus (P<sub>20</sub>, P<sub>40</sub>, P<sub>60</sub>), potassium (K<sub>10</sub>, K<sub>20</sub>, K<sub>30</sub>), and one level of gibberellic acid GA<sub>3</sub> (G<sub>1</sub> = 100ppm). This study flowing the weight of 1000-grain, Grain yield, biological yield and straw yield were affected by experimental treatments. In evaluating the effects, the highest rate of studies traits was obtained at yield parameters in bean. Moreover, due to the application of 100ppm gibberellic acid with N<sub>60</sub>, P<sub>60</sub>, K<sub>30</sub> kg/ha the highest rate was obtained from weight of 1000 grain, Grain yield and biological yield, but in the parameter of straw yield was earned low amount then T<sub>4</sub> during 2022 and 2023 year. In addition, investigating the effect of gibberellic acid showed that the highest rate of grain yield was obtained at T<sub>7</sub>.

## 1 Introduction

Fabaceae is the third largest land plant by number of species with nearly twenty thousand known species. There are numerous varieties grown all over the world that all have distinct features, textures, and flavors [1]. Some of the most popular beans include green beans, lima beans, kidney beans, black beans, chickpeas, and soybeans [2]. The popularity of beans is due to being affordable, easily transportable due to long shelf-life, and high nutritional content [3]. Beans are a major source of protein, dietary fiber, carbohydrates, minerals, and vitamins [4]. They offer high protein and amino acid content while being lower in calories and saturated fat than many high protein sources, such as meat and dairy products [5]. The regulators may be composed of indolebutyric acid, kinetin and gibberellic acid, which act to increase plant growth and development, increase cell wall extensibility, and absorb water and nutrients [6]. Gibberellins constitute a group of plant hormones that

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act in the elongation and cell division [7], which are synthesized in the form of gibberellic acid. This regulator's concentration and plant tissues sensitiveness to this compound determine plants response regarding growth and development. Thus, the exogenous application of gibberellic acid in bean plants may directly influence plant growth, as well as its morphological and reserve attributes [5, 6]. This study aimed at evaluating the influence of gibberellic acid applied exogenously on bean crop due to growth, and analyzing its effects on morphological attributes of physiological quality of the seeds produced.

## 2 Method and materials

The experiment conducted to know the Influence of NPK and gibberellic acid on yield of bean (*Phaseolus vulgaris* L.) was carried out at Crop Research Farm of Alberoni University, Kapisa, Afghanistan in 2022 and 2023. The experiment was laid out in an CRBD (Complete Randomized Block Design) consisting of seven treatments including Control with 3 replications, with the treatment combinations (T<sub>1</sub>) control, (T<sub>2</sub>) N at 30 kg/ha, P at 20 kg/ha, K at 10 kg/ha (T<sub>3</sub>) N at 45 kg/ha, P at 40 kg/ha, K at 20 kg/ha, (T<sub>4</sub>) N at 60 kg/ha, P at 60 kg/ha, K at 30 kg/ha, (T<sub>5</sub>) N at 30 kg/ha, P at 20 kg/ha, K at 10 kg/ha + GA<sub>3</sub> at 100 ppm, (T<sub>6</sub>) N at 45 kg/ha, P at 40 kg/ha, K at 20 kg/ha + GA<sub>3</sub> at 100 ppm, (T<sub>7</sub>) N at 60 kg/ha, P at 60 kg/ha, K at 30 kg/ha + GA<sub>3</sub> at 100 ppm. The statistical analysis of data done by opstats software online.

## 3 Result and discussion

The analysis of data shows that NPK and GA<sub>3</sub> had significant effect on the yield and yield parameter of bean like 1000-grain weight, grain yield biological yield, and straw yield. Among these parameters 1000-grain weight, grain yield and biological yield, was significantly higher at the T<sub>7</sub> (N<sub>60</sub> P<sub>60</sub>K<sub>30</sub>kg/ha + GA<sub>3</sub> 100 ppm) except straw yield in both years. Obviously, this indicates the role of NPK and gibberellins on yield and yield parameter of beans in both years (2022-2023). Application of NPK and GA<sub>3</sub> had significant effect on 1000-grain weight. Maximum 1000 grain weight (365.93 g and 296.50g) were recorded from T<sub>7</sub> (N<sub>60</sub> P<sub>60</sub>K<sub>30</sub> kg/ha + GA<sub>3</sub> 100 ppm) which was statistically different with all treatments. While the minimum 1000-grain weight (223.53g and 232.67) was recorded in T<sub>1</sub> which is Control. Because of NPK and GA<sub>3</sub> application, beneficial effects on the yield products and improve yield attributes, significant and maximum weight was seen with GA<sub>3</sub> application with higher levels of NPK. Similar outcomes were seen by [8]. The results of observations have shown maximum grain yield (1.97t/ha and 1.83 t/ha) in the T<sub>7</sub> (N<sub>60</sub> P<sub>60</sub>K<sub>30</sub>kg/ha + GA<sub>3</sub> 100 ppm) which attentional was had various with remain of them. While the minimum was recorded in T<sub>1</sub> (1.13t/ha and 0.71 t/ha) that is Control [9 and 10]. The investigation of biological yield has played maximum yield (5.52t/ha and 6.21t/ha) in the T<sub>7</sub> which significantly had differed at T<sub>6</sub>, while the minimum was reported in T<sub>1</sub> (1.85t/ha and 4.54t/ha) that is control and also this results have confirmed [10]. The result of straw yield has differently feedback then other parameters of yield. The observation has shown maximum straw yield (3.28 t/ha) in the T<sub>7</sub> in 2022 year, but in 2023 has replayed (4.67t/ha) in the T<sub>4</sub>, while the lowest was registered in the control (1.10 t/ha and 3.59 t/ha) in the both of year [10, 11].

**Table 1.** Effects of NPK and GA<sub>3</sub> on yield attributes of bean

Treatment s	2022				2023			
	weight 1000 (g)	Bio. yield (t/ha)	Grain yield (t/ha)	Straw yield (t/ha)	weight 1000 (g)	Bio. yield (t/ha)	Grain yield (t/ha)	Straw yield (t/ha)
T <sub>1</sub>	223.53	1.85	0.75	1.10	232.67	4.54	0.95	3.59
T <sub>2</sub>	229.63	3.23	1.27	1.92	243.57	5.50	1.00	4.50
T <sub>3</sub>	251.10	3.76	1.44	2.23	271.20	5.77	1.11	4.66
T <sub>4</sub>	263.80	4.04	1.52	2.40	286.63	5.82	1.16	4.67
T <sub>5</sub>	255.73	4.91	1.80	2.92	258.73	5.55	1.02	4.52
T <sub>6</sub>	294.93	4.47	1.68	2.61	269.03	5.66	1.34	4.32
T <sub>7</sub>	365.93	5.52	1.97	3.28	296.50	6.21	1.83	4.38
SE(m)±	11.595	0.128	0.111	0.077	4.769	0.018	0.016	0.025
CD (P0.05)	35.51	0.398	0.345	0.24	14.857	0.057	0.05	0.078

## 4 Conclusion

The present research confirms that application higher level of NPK and concentration of GA<sub>3</sub> at 100 ppm interact significantly effect on 1000-wieght grain, biological yield and grain yield consequently to increase yield of beans. Based on the results of this study, it may be concluded that for obtaining higher yield of bean should be applied N<sub>60</sub> P<sub>60</sub>K<sub>30</sub>kg/ha and concentration of GA<sub>3</sub> 100 ppm in the study area.

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