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Effect of NPK and FYM conjugated with PSB on growth and yield of okra (*Abelmoschus esculentus* L.) *var*. super green

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Abstract
The field experiment was conducted during Kharif season of 2023 at the research farm of Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh), India. The purpose of the research was to study the effect of NPK and FYM conjugated with PSB on growth and yield of Okra (*Abelmoschus esculentus* L.) *var*. Super Green. The experiment comprised of 9 treatments and three levels of NPK (0%, 50% and 100%), three levels of FYM (0%, 50% and 100%), one level of PSB (100%) respectively. Among the different treatment combinations, T_9 (NPK @ 100% + FYM @ 100% + PSB) gave the best result in respect of growth and yield of okra, on the other hand the lowest outcomes towards growth and yield were found in T_1 (Absolute control).

Keywords: NPK, FYM, PSB, growth, yield, okra

Introduction
A common vegetable grown throughout the world's tropical and subtropical regions is okra (*Abelmoschus esculentus* L.). It is a member of the Malvaceae family. The fruit of okra plant is edible. As a member of the Malvaceae family and a semi-pollinated plant, okra contributes significantly to the nation's need for vegetables, which are scarce on the market. Okra's nutritional components is calcium, protein, oil, carbohydrate, iron, magnesium, phosphorus. (Adesida *et al.*, 2019) [1].

Gujarat, West Bengal, Bihar, Madhya Pradesh, Odisha, Jharkhand, and Andhra Pradesh are the states that cultivate okra the most. Okra yields fruit for a long period, but for a bigger production and better quality, it need a balanced and appropriate supply of nutrients. (National Horticulture Board data, 2020) [10].

Enhancing soil structure, water retention ability, and nutrient holding capacity are all made possible by FYM. Crop productivity rises as a result of these advancements. Additionally, it boosts the soil's microbial activity, which enhances the availability of minerals and plant nutrients. (Premsekhar and Rajshree, 2009) [11].

The building block of proteins, nitrogen is also a crucial component of the substances that control the growth and development of plants. Nitrogen is also a key component of chlorophyll, which is the substance that allows plants to use solar energy for photosynthesis. (Khetran *et al.*, 2016) [6].

Plant cells contain phosphorus, which is necessary for cell division and the development of the plant's growing tip. Being a component of ATP, phosphorus is one of the primary promoters of photosynthesis, nutrient transport, and energy transfer. (Meena *et al.*, 2017) [9].

Additionally, potassium helps in controlling the stomata's opening and shutting, which controls the exchange of oxygen, carbon dioxide, and water vapor. Plant growth is stunted and yield is decreased if K is insufficient or not provided in sufficient proportions. Potassium enhances drought resistance and promotes root growth. (Bhende *et al.*, 2015) [2].

The capacity of PSB to dissolve insoluble phosphates, fix nitrogen, and synthesize plant growth regulators among its growth-promoting properties. (Rodriguez and Fraga 1999). [12].

Materials and Methods

The study was carried out in the kharif season of 2023 at the research farm of the Department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Uttar Pradesh), India at 25°24'30" North latitude and 81°51'10" East longitude and 98 meters (322 feet) above the mean sea level. The site is located 4-5 km away from the city at the right bank of the Yamuna River, representing the Agro-Climatic Zone (Upper Gangetic Plain) and the Agro-ecological Sub Region [North Alluvium plain zone (0-1% slope)].

The Prayagraj district of Uttar Pradesh, with its exceptionally hot summers and relatively fairly cold winters, embodies the sub-tropical region of the state's southeast. In summer, the location's highest temperature varies from 46 to 48^{0}C, and in winter, it seldom falls below 4 to 5^{0}C. There is a 20-94% variation in relative humidity and average annual rainfall is 1100 mm.

The experiment was laid out in Randomized Block Design (RBD) with 9 treatments and three levels of NPK (0%, 50% and 100%), three levels of FYM (0%, 50% and 100%), one level of PSB (100%) respectively. Plant height, number of branches per plant, number of leaves per plant under different treatments were recorded at 25, 50 and 75 days after sowing. The data of the number of fruits per plant and yield of fruits were also recorded under different treatments.

Table 1: Treatment combination

Treatment	Treatment combination
T_1	ABSOLUTE CONTROL
T_2	[NPK @0% + FYM @50% + PSB]
T_3	[NPK @0% + FYM @100% + PSB]
T_4	[NPK @50% + FYM @0% + PSB]
T_5	[NPK @50% + FYM @50% + PSB]
T_6	[NPK @50% + FYM @100% + PSB]
T_7	[NPK @100% + FYM @0% + PSB]
T_8	[NPK @100% + FYM @50% + PSB]
T_9	[NPK @100% + FYM @100% + PSB]

Results and Discussion

Height of plant at 25, 50, 75 DAS: The effect of NPK and FYM conjugated with PSB on the height of okra plant was found significant.The result revealed that among all applied treatments, the highest plant height (34.29cm,72.6cm and 109.55cm) was found in T_9 (NPK@100%+FYM@100%+PSB) at 25, 50, and 75 DAS respectively and lowest plant height (21.01cm, 56.55cm, 95.76cm) was found in T_1 (Absolute control) at 25, 50 and 75 DAS respectively.

Number of brunches Plant^{-1} at 25, 50, 75 DAS

The effect of NPK and FYM conjugated with PSB on the number of brunches of okra plant was found significant. Among all applied treatments, the maximum number of brunches Plant^{-1}(6.98,7.27,8.86) was recorded in T_9 (NPK@100%+FYM@100%+PSB) at 25, 50, and 75 DAS respectively and the minimum number of brunches Plant $^{-1}$ (2.01,3.44,4.11) was found in T_1 (Absolute control) at 25, 50 and 75 DAS respectively.

Number of leaves plant^{-1} at 25, 50, 75 DAS

The effect of NPK and FYM conjugated with PSB on number of leaves Plant^{-1} at 25, 50, and 75 DAS was found significant. Among all applied treatments, number of leaves Plant^{-1} (20.49,37.11,42.44) was exhibited maximum in T_9 (NPK@100%+FYM@100%+PSB) at 25, 50, and 75 DAS respectively and it was followed by found to be lowest (11.13, 27.45, and 32.76) in T_1 (Absolute control) at 25, 50 and 75 DAS respectively.

Number of fruits plant^{-1}

The effect of NPK and FYM conjugated with PSB on number fruits per plant of Okra was found significant. Among all applied treatments, highest number of fruits per plant (25.01) was exhibited maximum in T_9 (NPK@100%+FYM@100%+PSB) and found to be lowest (14.39) in T_1(Absolute control).

Yield

The effect of NPK and FYM conjugated with PSB on yield of Okra was found significant. Among all applied treatments, maximum yield (121.57) was exhibited in T_9 (NPK@100%%+FYM@100+PSB) and lowest yield (70.88) were recorded in T_1 (Absolute control).

Table 2: Effect of NPK and FYM conjugated with PSB on plant height, number of brunches, number of leaves, number of fruits per plant and yield of Okra (*Abelmoschus esculentus* L.) *var*. Super Green

Treatments	Plant Height (cm)			No. of brunches Plant^{-1}			No. of Leaves Plant^{-1}			Fuit Plant^{-1}	Yield (q ha^{-1})
	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS	25 DAS	50 DAS	75 DAS		
T_1	21.01	56.55	95.76	2.01	3.44	4.11	11.13	27.45	32.76	14.39	70.88
T_2	25.38	61.24	99.33	3.13	4.27	5.07	13.87	30.69	35.53	17.20	77.04
T_3	26.65	62.46	101.49	3.37	4.55	5.23	14.22	31.48	36.37	18.58	82.28
T_4	28.79	64.78	103.55	3.57	4.95	5.86	15.56	32.09	37.78	19.23	88.01
T_5	29.37	65.09	104.39	4.26	5.36	6.11	16.35	33.67	38.11	20.71	92.34
T_6	30.11	66.30	105.10	4.87	5.73	6.89	17.33	34.29	39.38	21.44	97.44
T_7	32.48	69.44	107.28	5.18	6.37	7.38	18.48	35.20	40.76	23.01	112.18
T_8	33.69	71.49	108.59	6.24	6.98	8.25	19.11	36.41	41.30	24.67	116.33
T_9	34.29	72.61	109.55	6.98	7.27	8.86	20.49	37.11	42.44	25.01	121.57
F- Test	S	S	S	S	S	S	S	S	S	S	S
S.Em. (±)	0.53	1.02	1.68	0.09	0.10	0.11	0.22	0.58	0.71	0.31	1.38
C.D.@5%	1.09	2.16	3.43	0.20	0.23	0.27	0.50	1.19	1.53	0.70	2.82

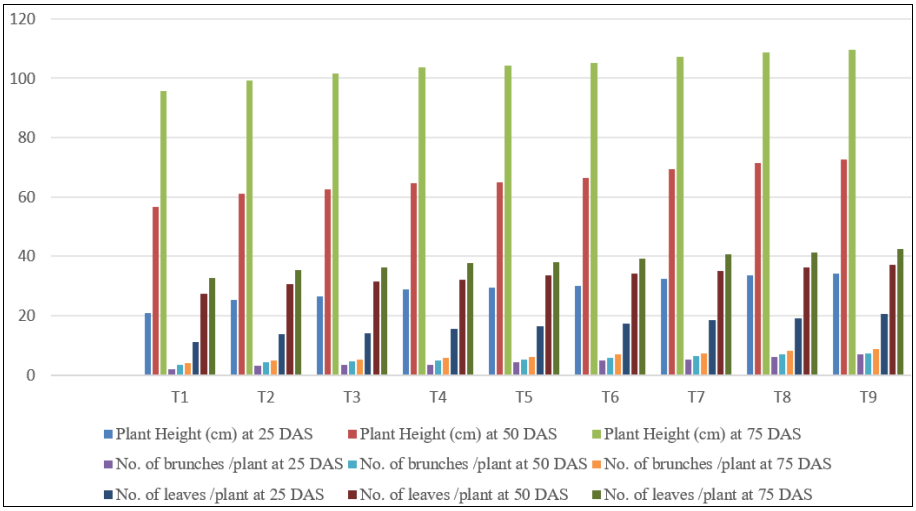

Fig 1: Graphical representation of effect of NPK and FYM conjugated with PSB on plant height, number of brunches and number of leaves of Okra plant (*Abelmoschus esculentus* L.) *var.* Super Green

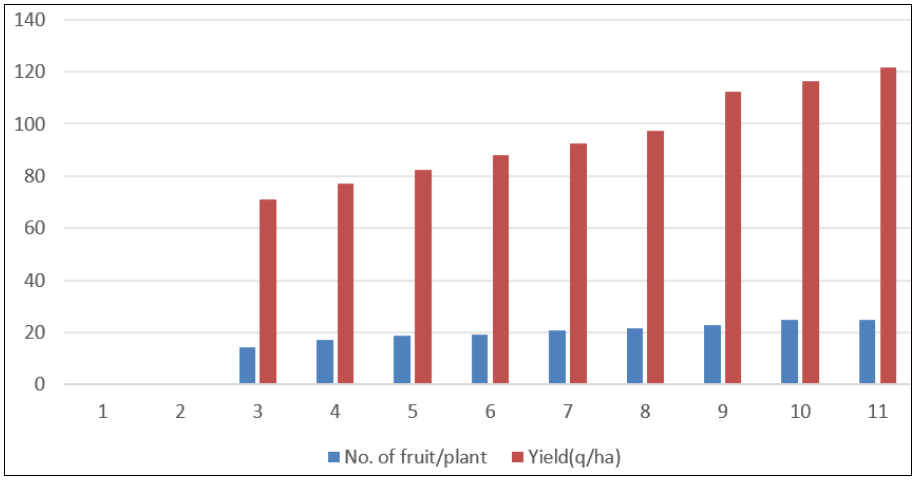

Fig 2: Graphical representation of effect of NPK and FYM conjugated with PSB on number of fruits per plant and yield Okra (*Abelmoschus esculentus* L.) *var.* Super Green

Conclusion

The field experiment revealed that the application of NPK, FYM and PSB at the different levels had great impact on the overall performance of okra. It is concluded that the best outcomes regarding gowth and yield of okra were observed in T_9 (NPK @ 100% + FYM @ 100% + PSB).

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