

# EFFECT OF DIFFERENT LEVELS OF NAPHTHALENE ACETIC ACID (NAA) AND SALICYLIC ACID (SA) ON GROWTH, YIELD AND BIOCHEMICAL ASPECTS OF GREEN GRAM (*VIGNA RADIATA* L.)

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## ABSTRACT

The study was conducted at Department of Biological Sciences, SHIATS, Allahabad (U.P.). A field experiment was conducted to study the effect of naphthalene acetic acid (25,50 ppm), salicylic acid (20, 40 ppm) and naphthalene acetic acid + salicylic acid (25 + 20, 25 + 40, 50 + 20, 50 + 40 ppm) on growth, yield and biochemical aspects of green gram (*Vigna radiata* L. Wilczek). Altogether, 9 treatments were given as foliar spray including control. The PGR were applied at 15, 30, 45 DAS. The experiment was laid out in CRD with 3 replications. The combination treatment T6, T7 and T8 shows the significantly increased in growth, yield and biochemical aspects of green gram as compared to individual treatment. Naphthalene acetic acid 50 + salicylic acid at 20 ppm were most effective indicating optimum doses respectively and SA was found to be superior than NAA for influencing metabolite contents.

## INTRODUCTION

Green gram is the third most important pulse crop in India. It is quite versatile crop grown for seeds, green manure and forage and it is also considered as "Golden Bean" because of its nutritive values and suitability for increasing the soil, by the way of addition of nitrogen to the soil. (Anonymous 2004). It has high nutritive value, and due to this, has advantage over the other pulses. The seed contains 24.20% protein content, 1.30% fat, and 60.4% carbohydrates; calcium (Ca) is 118 and phosphorus (P) is 340 mg per 100 g of seed, respectively (Imran *et al.*, 2016).

Plant growth regulators (PGRs) which can improve the physiological efficiencies of plant could play a significant role in increasing crop yield and quality, when applied as foliar spray at proper crop growth stage in optimum concentration (Garai and Datta, 2003). In India population is growing rapidly so, Increase of pulse production is urgently needed to meet up the demand of proteinous part in our daily diet and also to increase pulse consumption. The application of NAA can increase fruit setting ratio, prevent fruit dropping, promote flower sex ratio. Foliar application of NAA has also found to increase plant height, number of leaves per plant, fruit size with consequent enhancement in seed yield in different crops (Lee, 1990).

Garden pea was found to show a quick growth, higher yield and quality when treated plant growth regulators especially GA<sub>3</sub> and NAA (Kumar *et al.*, 2014). Foliar application of

salicylic acid exerted a significant effect on plant growth and metabolism when applied at physiological concentration and thus acted as one of the plant growth regulating substances (Kalarani *et al.*, 2002). SA plays a role during the plant response to abiotic stresses such as drought, chilling, heavy metal toxicity, heat, and osmotic stress (Rivas *et al.*, 2011). Keeping in view the above facts the present experiment was undertaken to find out effect of different levels of naphthalene acetic acid (NAA) and salicylic acid (SA) on growth, yield and biochemical aspects of green gram.

## MATERIALS AND METHODS

The study was conducted at Department of Biological Sciences, SHIATS, Allahabad (U.P.), Data were recorded at 20, 40, 60 days after sowing for growth measurement like plant height, number of branches per plant and number of leaves per plant.

For yield parameters numbers of pods per plant were collected at 50, 60 days after sowing. Also, length of pod per plant in (cm) were calculated at 50 DAS. And number of seeds per pod, number of seeds per plant, seed yield per plant in (g) were calculated at 70 DAS.

In biochemical analysis Chlorophyll a, Chlorophyll b, Total chlorophyll and Chlorophyll ratio was determined at 40 DAS according to Lichtenthaler and Wellburn (1983) method. Total protein in seed was determined by using method of Bradford. Total carbohydrates content in seeds was determined by using method of Hedge and Hofreiter (1962) method.

## RESULTS AND DISCUSSION

Effect of different levels of (NAA) and (SA) on growth aspects of green gram (*Vigna radiata* L.).

The result of present experiment indicates that the foliar application of (NAA) and (SA) significantly increased the growth, yield and biochemical aspects of green gram (*Vigna radiata* L.). Application of growth regulators significantly increased plant growth over the control. The data in table No. 1 clearly indicated that when plants were sprayed with different concentration of NAA and SA, Results indicated that the application of T6 recorded significantly plant height at 20 days (18.01 cm), T7 recorded significantly plant height (29.66 cm) at 40 days and (42.27 cm) at 60 days. Dixit and Elamathi (2007) reported that NAA increased the plant height of green gram. Muthulakshmi and Lingakumar (2016) noticed that SA enhanced plant height of black gram. The application of T7 recorded significantly number of branches per plant at 20 days (1.33) and 40 days (3.33); but, at 60 days T8 (4.44) recorded significantly number of branches per plant Shohag *et al.* (2008) noticed that NAA increased the number of branches per plant of green gram. Umesh *et al.* (2014) reported

that SA increased the number of branches per plant of tomato. T8 recorded significantly number of leaves per plant at 50 days (15.33) Shohag *et al.* (2008) revealed that NAA increased number of leaves per plant of green gram.

Effect of different levels of (NAA) and (SA) on yield and biochemical aspects of green gram (*Vigna radiata* L.).

Pod length per plant at 50 DAS (7.11 cm) Siddik *et al.* (2016) reported that NAA increased pod length per plant of sesame. Whereas, T6 recorded maximum number of seeds per pod (5.65) Dixit and Elamathi (2007) revealed that NAA increased number of seeds per pod of green gram and T4 showed highest chlorophyll ratio a/b (2.19 g/mg) at 40 DAS. The application of T7 recorded significantly number of pods per plant at 50 DAS (12.22) Parmar *et al.* (2011) reported that NAA increased number of pods per plant of green gram. Number of seeds per plant (66.33) Dixit and Elamathi (2007) revealed that NAA increased number of seeds per plant of green gram. Seed yield per plant (3.43 g) Hesami *et al.* (2012) noticed that SA increased seed yield per plant of coriander. Chlorophyll a content (1.75 mg/g) at 40 DAS, chlorophyll b content (1.10 mg/g) at 40 DAS, total chlorophyll (2.85 mg/g) at 40 DAS Rajesh *et al.* (2014) recorded that NAA increased chlorophyll

**Table 1: Effect of different levels of (NAA) and (SA) on growth, yield and biochemical aspects of green gram (*Vigna radiata* L.)**

Treatments	Plant height (cm)			No. of branches per plant			No. of leaves per plant 50 DAS
	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	
T0: Control	16.91	26.76	37.99	0.77	2.7	3.55	12.67
T1: NAA @ 25 ppm	17.14	26.89	38.35	0.88	2.77	3.66	13
T2: NAA @ 50 ppm	17.16	27.06	38.79	0.88	2.88	3.66	13
T3: SA @ 20 ppm	17.24	27.4	39.06	1	2.88	3.77	13.33
T4: SA @ 40 ppm	17.2	27.34	39.78	1.11	2.99	3.88	13.67
T5: NAA @ 25 ppm + SA @ 20 ppm	17.25	27.97	40.15	1	3	4	14
T6: NAA @ 25 ppm + SA @ 40 ppm	18	28.14	40.45	1.11	3.11	3.99	14
T7: NAA @ 50 ppm + SA @ 20 ppm	17.61	29.66	42.27	1.33	3.33	4.33	15
T8: NAA @ 50 ppm + SA @ 40 ppm	17.65	28.56	41.79	1.22	3.22	4.44	15.33
SEm	0.16	0.52	0.58	0.09	0.11	0.11	0.35
CD (5%)	0.49	1.55	1.74	0.27	0.35	0.34	1.04
F-value	**	*	**	*	*	**	**
Grand mean	17.35	27.75	39.85	1.03	2.99	3.92	13.78
CV (%)	1.6	3.3	2.6	15.3	6.8	5.2	4.4

**Table 1: Cont.....**

Treatments	No. of pods per plant at 50 DAS	No. of seeds per pod	No. of seeds per plant	Pod length per plant (cm) at 50 DAS	Seed yield per plant (g)
T0: Control	9.77	5.24	51.22	6.47	2.73
T1: NAA @ 25 ppm	9.89	5.43	53.66	6.55	2.85
T2: NAA @ 50 ppm	10.89	5.24	57.11	6.60	2.94
T3: SA @ 20 ppm	10.77	5.42	58.44	6.53	3.06
T4: SA @ 40 ppm	11.00	5.27	58.00	6.68	3.06
T5: NAA @ 25 ppm + SA @ 20 ppm	11.00	5.35	58.89	6.60	3.08
T6: NAA @ 25 ppm + SA @ 40 ppm	11.11	5.65	62.66	6.94	3.26
T7: NAA @ 50 ppm + SA @ 20 ppm	12.22	5.42	66.33	6.97	3.43
T8: NAA @ 50 ppm + SA @ 40 ppm	11.77	5.47	64.44	7.10	3.34
SEm	0.33	0.11	2.01	0.09	0.09
CD (5%)	0.97	0.32	5.98	0.29	0.29
F-value	**	NS	**	**	**
Grand mean	10.93	5.39	58.97	6.72	3.08
CV (%)	5.2	3.5	5.9	2.6	5.5

Table 1: Cont.....

Treatments	Chlorophyll content (mg/g)			Chlorophyll (a/b) at 40 DAS	Total protein content (%) in seed	Total Carbohydrate content (%) in seed
	Chlorophyll a (mg/g) at 40 DAS	Chlorophyll b (mg/g) at 40 DAS	Total ratio Chlorophyll (mg/g) at 40 DAS			
T0: Control	1.22	0.76	1.99	1.68	20.57	61.74
T1: NAA @ 25 ppm	1.38	0.8	2.19	1.74	20.8	62.63
T2: NAA @ 50 ppm	1.43	0.97	2.4	1.47	21.47	62.71
T3: SA @ 20 ppm	1.41	0.85	2.26	1.73	21.67	63.1
T4: SA @ 40 ppm	1.59	0.8	2.4	2.19	21.37	63.26
T5: NAA @ 25 ppm + SA @ 20 ppm	1.57	1.07	2.64	1.51	21.67	63.17
T6: NAA @ 25 ppm + SA @ 40 ppm	1.65	1.04	2.7	1.61	21.6	62.96
T7: NAA @ 50 ppm + SA @ 20 ppm	1.74	1.1	2.84	1.6	22.23	64.34
T8: NAA @ 50 ppm + SA @ 40 ppm	1.57	1.1	2.68	1.43	22.13	63.75
SEm	0.06	0.09	0.1	0.27	0.48	0.13
CD (5%)	0.2	0.28	0.31	0.81	1.43	0.39
F-value	**	NS	**	NS	NS	**
Grand mean	1.51	0.94	2.45	1.66	21.5	63.07
CV (%)	7.7	17.5	7.5	28.5	3.9	0.4

\* and \*\* indicates 5% and 1% level of significance, respectively; ns = non-significant.

content during reproductive stage of green gram. Maity and Bera (2009) observed that SA significantly increased chlorophyll a, b and total chlorophyll content in green gram. Total protein content in seed (22.23 %) Rajesh et al. (2014) noticed that NAA increased seed protein content (%) in green gram. Total carbohydrates content in seed (64.34 %) compared to others treatments. While T0 (no treatment) recorded significantly lower values for all the growth, yield and biochemical aspects of green gram except chlorophyll ratio and number of seeds per pod.

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