

Effect of seed invigouration treatments on growth parameters of soybean

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An experiment on soybean variety JS-335 with two different lots L_1 and L_2 (72% and 57% germination, respectively) was conducted at the experimental farm of department of Agril. Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola to study the effect of seed invigouration treatments on growth parameters. The experiment was laid out in Factorial Randomised Block Design with 7 treatments and three replications. Results showed that growth parameters viz., plant height, leaf area, total dry matter were significantly increased by invigouration treatments. The results indicated that at all the stages of development invigouration treatment of seed with IAA+NAA (10 ppm and 6 hrs hydration) i.e. T_1 showed maximum plant height, leaf area and total dry matter.

Key words : Invigouration treatments, Plant height, Leaf area, Dry matter

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INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is a miracle “Golden Bean” of the 21st century mainly due to its high protein (38-41%) content and about 20% cholesterol free oil. In India it is mainly grown as a oilseed crop. Total area under soybean cultivation in Maharashtra is 24,400 ha and production is 27,078 tonnes of seed. In Vidarbha area under soybean was 6,431 ha with the production of 7,054 tonnes of (Anonymous, 2006). The productivity of soybean is a result of interactions between genetic make up and environmental conditions. The genetic make-up is expressed through the physiological processes operating within the plant. Efficiency of physiological processes depends on morphological characters of plant. Thus, productivity can be manipulated to some extent through manipulation of morphological characters. The important morphological characters, associated with “Effect of seed invigouration treatments on growth parameters of soybean” productivity are plant height, leaf area and dry matter per plant. In view of above, the present investigation was undertaken to study the effect of invigouration of growth parameters.

RESEARCH METHODOLOGY

The field experiment was conducted at the experimental farm of Department Agril. Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the

object to know the influence of seed invigouration treatments on growth parameters of soybean. This experiment was carried out in Factorial Randomised Block Design with three replications and seven treatments of soybean cultivar JS-335 with two different lots viz., L_1 and L_2 (72% and 57% germination, respectively). The observations were recorded from 15 DAS to 75 DAS at an interval of 15 days.

For recording the plant height, leaf area and total dry matter, five plants in each plot in each replication were randomly selected and labelled. For recording periodic observations on growth parameters, five plants were randomly selected from each plot. These plants were watered before uprooting and were removed with the help of fork to keep root system intact. These plants were washed thoroughly and were used for recording observations.

Plant height was measured from the ground level up to the tip of the main axis in centimeters at an interval of 15 days. Leaf area was measured by taking third leaf from apex amongst fully opened leaves which is supposed to be fully active. Leaf area was calculated with the help of formula given by (Babich and Makrov, 1969). After the measurement of leaf area, leaves and stem of all the plants were dried in oven at 70°C till the samples showed constant dry weight.

The details of treatments are given below:

DAS	30 DAS		45 DAS		60 DAS		75 DAS	
	V	X	V	X	V	X	V	X
0	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
15	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
30	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
45	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
60	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
75	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
Mean	1.33	1.11	1.33	1.11	1.33	1.11	1.33	1.11
S.E.	0.288	0.288	0.288	0.288	0.288	0.288	0.288	0.288
C.V. %	0.173	0.173	0.173	0.173	0.173	0.173	0.173	0.173

- T₀- untreated (control)
- T₁- IAA+NAA (10 ppm. 6hrs hydration)
- T₂- IAA+NAA+Thiram
- T₃- Hydration for 16 hours+Thiram (2g/kg) dry dressing after hydration
- T₄- Hydration for 6 hours+Thiram dry dressing after hydration
- T₅- GA₃ 50 ppm *i.e.* hydration in GA₃ 50 ppm for 6 hours.
- T₆- GA₃ 50 ppm+Thiram *i.e.* T₅+Thiram

RESULTS AND ANALYSIS

The results of the present investigation have been presented in Table 1, 2 and 3.

Plant height:

Data revealed that seed invigouration treatments showed rapid increase in growth from 15 DAS to 60 DAS indicating intermediate habit of growth. Plants though grew after 60 DAS, showed slow growth. The differences in height of plant were found to be significant at all the stages of growth for lots and invigouration treatments where as lots x interaction were non significant (Table 1).

High vigoured lot (L₁) showed improved plant height over low vigoured lot (L₂). Invigouration treatment T₁ showed increased plant height over control. All the treatments exhibited better plant height as compared to control in both the lots. Similar results were reported by Yadava and Sreenath (1975), Pawar *et al.* (1976) and Maske *et al.* (1998).

Leaf area:

Mean leaf area/plant was significantly affected by seed invigouration treatments, lots and their interactions at all stages of growth except for lots at 15 DAS. Mean leaf area/plant gradually increased upto 60 DAS followed by sharp decline in the last phase. The decrease in leaf area per plant during final phase of growth is attributed to senescence. Leaf area per plant was higher in high vigour lot (L₁) than low vigour lot (L₂). Treatment T₁, T₂ and T₆ showed increased leaf area per plant over control (Table 2). Rest of the invigouration treatments exhibited lower leaf area per plant as compared to control. Both the high and low vigour lots when treated with IAA+NAA (T₁), IAA+NAA+Thiram (T₂) and GA₃+Thiram (T₆) showed increased leaf area per plant. Similar pattern of leaf area development was reported by Rao *et al.* (1976), Allurwar (1982) and Maske *et al.* (1998).

S.O. No.	30 DAS		45 DAS		60 DAS		75 DAS	
	V	X	V	X	V	X	V	X
1	0.50	0.75	3.83	2.91	7.93	6.91	11.21	10.36
2	0.99	2.36	1.35	1.11	9.35	8.45	13.75	12.70
3	1.50	3.80	1.10	1.00	9.10	8.01	13.10	12.15
4	2.01	5.31	3.11	3.21	11.21	10.36	15.51	14.56
5	2.50	6.80	4.61	4.70	13.71	12.76	18.01	17.06
6	3.00	8.30	6.11	6.20	16.21	15.26	20.51	19.56
7	3.50	9.80	7.61	7.70	18.71	17.76	23.01	22.06
8	4.00	11.30	9.11	9.20	21.21	20.26	25.51	24.56
9	4.50	12.80	10.61	10.70	23.71	22.76	28.01	27.06
10	5.00	14.30	12.11	12.20	26.21	25.26	30.51	29.56
11	5.50	15.80	13.61	13.70	28.71	27.76	33.01	32.06
12	6.00	17.30	15.11	15.20	31.21	30.26	35.51	34.56
13	6.50	18.80	16.61	16.70	33.71	32.76	38.01	37.06
14	7.00	20.30	18.11	18.20	36.21	35.26	40.51	39.56
15	7.50	21.80	19.61	19.70	38.71	37.76	43.01	42.06
16	8.00	23.30	21.11	21.20	41.21	40.26	45.51	44.56
17	8.50	24.80	22.61	22.70	43.71	42.76	48.01	47.06
18	9.00	26.30	24.11	24.20	46.21	45.26	50.51	49.56
19	9.50	27.80	25.61	25.70	48.71	47.76	53.01	52.06
20	10.00	29.30	27.11	27.20	51.21	50.26	55.51	54.56
21	10.50	30.80	28.61	28.70	53.71	52.76	58.01	57.06
22	11.00	32.30	30.11	30.20	56.21	55.26	60.51	59.56
23	11.50	33.80	31.61	31.70	58.71	57.76	63.01	62.06
24	12.00	35.30	33.11	33.20	61.21	60.26	65.51	64.56
25	12.50	36.80	34.61	34.70	63.71	62.76	68.01	67.06
26	13.00	38.30	36.11	36.20	66.21	65.26	70.51	69.56
27	13.50	39.80	37.61	37.70	68.71	67.76	73.01	72.06
28	14.00	41.30	39.11	39.20	71.21	70.26	75.51	74.56
29	14.50	42.80	40.61	40.70	73.71	72.76	78.01	77.06
30	15.00	44.30	42.11	42.20	76.21	75.26	80.51	79.56
31	15.50	45.80	43.61	43.70	78.71	77.76	83.01	82.06
32	16.00	47.30	45.11	45.20	81.21	80.26	85.51	84.56
33	16.50	48.80	46.61	46.70	83.71	82.76	88.01	87.06
34	17.00	50.30	48.11	48.20	86.21	85.26	90.51	89.56
35	17.50	51.80	49.61	49.70	88.71	87.76	93.01	92.06
36	18.00	53.30	51.11	51.20	91.21	90.26	95.51	94.56
37	18.50	54.80	52.61	52.70	93.71	92.76	98.01	97.06
38	19.00	56.30	54.11	54.20	96.21	95.26	100.51	99.56
39	19.50	57.80	55.61	55.70	98.71	97.76	103.01	102.06
40	20.00	59.30	57.11	57.20	101.21	100.26	105.51	104.56
41	20.50	60.80	58.61	58.70	103.71	102.76	108.01	107.06
42	21.00	62.30	60.11	60.20	106.21	105.26	110.51	109.56
43	21.50	63.80	61.61	61.70	108.71	107.76	113.01	112.06
44	22.00	65.30	63.11	63.20	111.21	110.26	115.51	114.56
45	22.50	66.80	64.61	64.70	113.71	112.76	118.01	117.06
46	23.00	68.30	66.11	66.20	116.21	115.26	120.51	119.56
47	23.50	69.80	67.61	67.70	118.71	117.76	123.01	122.06
48	24.00	71.30	69.11	69.20	121.21	120.26	125.51	124.56
49	24.50	72.80	70.61	70.70	123.71	122.76	128.01	127.06
50	25.00	74.30	72.11	72.20	126.21	125.26	130.51	129.56
51	25.50	75.80	73.61	73.70	128.71	127.76	133.01	132.06
52	26.00	77.30	75.11	75.20	131.21	130.26	135.51	134.56
53	26.50	78.80	76.61	76.70	133.71	132.76	138.01	137.06
54	27.00	80.30	78.11	78.20	136.21	135.26	140.51	139.56
55	27.50	81.80	79.61	79.70	138.71	137.76	143.01	142.06
56	28.00	83.30	81.11	81.20	141.21	140.26	145.51	144.56
57	28.50	84.80	82.61	82.70	143.71	142.76	148.01	147.06
58	29.00	86.30	84.11	84.20	146.21	145.26	150.51	149.56
59	29.50	87.80	85.61	85.70	148.71	147.76	153.01	152.06
60	30.00	89.30	87.11	87.20	151.21	150.26	155.51	154.56
61	30.50	90.80	88.61	88.70	153.71	152.76	158.01	157.06
62	31.00	92.30	90.11	90.20	156.21	155.26	160.51	159.56
63	31.50	93.80	91.61	91.70	158.71	157.76	163.01	162.06
64	32.00	95.30	93.11	93.20	161.21	160.26	165.51	164.56
65	32.50	96.80	94.61	94.70	163.71	162.76	168.01	167.06
66	33.00	98.30	96.11	96.20	166.21	165.26	170.51	169.56
67	33.50	99.80	97.61	97.70	168.71	167.76	173.01	172.06
68	34.00	101.30	99.11	99.20	171.21	170.26	175.51	174.56
69	34.50	102.80	100.61	100.70	173.71	172.76	178.01	177.06
70	35.00	104.30	102.11	102.20	176.21	175.26	180.51	179.56
71	35.50	105.80	103.61	103.70	178.71	177.76	183.01	182.06
72	36.00	107.30	105.11	105.20	181.21	180.26	185.51	184.56
73	36.50	108.80	106.61	106.70	183.71	182.76	188.01	187.06
74	37.00	110.30	108.11	108.20	186.21	185.26	190.51	189.56
75	37.50	111.80	109.61	109.70	188.71	187.76	193.01	192.06
76	38.00	113.30	111.11	111.20	191.21	190.26	195.51	194.56
77	38.50	114.80	112.61	112.70	193.71	192.76	198.01	197.06
78	39.00	116.30	114.11	114.20	196.21	195.26	200.51	199.56
79	39.50	117.80	115.61	115.70	198.71	197.76	203.01	202.06
80	40.00	119.30	117.11	117.20	201.21	200.26	205.51	204.56
81	40.50	120.80	118.61	118.70	203.71	202.76	208.01	207.06
82	41.00	122.30	120.11	120.20	206.21	205.26	210.51	209.56
83	41.50	123.80	121.61	121.70	208.71	207.76	213.01	212.06
84	42.00	125.30	123.11	123.20	211.21	210.26	215.51	214.56
85	42.50	126.80	124.61	124.70	213.71	212.76	218.01	217.06
86	43.00	128.30	126.11	126.20	216.21	215.26	220.51	219.56
87	43.50	129.80	127.61	127.70	218.71	217.76	223.01	222.06
88	44.00	131.30	129.11	129.20	221.21	220.26	225.51	224.56
89	44.50	132.80	130.61	130.70	223.71	222.76	228.01	227.06
90	45.00	134.30	132.11	132.20	226.21	225.26	230.51	229.56
91	45.50	135.80	133.61	133.70	228.71	227.76	233.01	232.06
92	46.00	137.30	135.11	135.20	231.21	230.26	235.51	234.56
93	46.50	138.80	136.61	136.70	233.71	232.76	238.01	237.06
94	47.00	140.30	138.11	138.20	236.21	235.26	240.51	239.56
95	47.50	141.80	139.61	139.70	238.71	237.76	243.01	242.06
96	48.00	143.30	141.11	141.20	241.21	240.26	245.51	244.56
97	48.50	144.80	142.61	142.70	243.71	242.76	248.01	247.06
98	49.00	146.30	144.11	144.20	246.21	245.26	250.51	249.56
99	49.50	147.80	145.61	145.70	248.71	247.76	253.01	252.06
100	50.00	149.30	147.11	147.20	251.21	250.26	255.51	254.56

S.O. No.	30 DAS		45 DAS		60 DAS		75 DAS	
	V	X	V	X	V	X	V	X
1	0.50	0.75	3.83	2.91	7.93	6.91	11.21	10.36
2	0.99	2.36	1.35	1.11	9.35	8.45	13.75	12.70
3	1.50	3.80	1.10	1.00	9.10	8.01	13.10	12.15
4	2.01	5.31	3.11	3.21	11.21	10.36	15.51	14.56
5	2.50	6.80	4.61	4.70	13.71	12.76	18.01	17.06
6	3.00	8.30	6.11	6.20	16.21	15.26	20.51	19.56
7	3.50	9.80	7.61	7.70	18.71	17.76	23.01	22.06
8	4.00	11.30	9.11	9.20	21.21	20.26	25.51	24.56
9	4.50	12.80	10.61	10.70	23.71	22.76	28.01	27.06
10	5.00	14.30	12.11	12.20	26.21	25.26	30.51	29.56
11	5.50	15.80	13.61	13.70	28.71	27.76	33.01	32.06
12	6.00	17.30	15.11	15.20	31.21	30.26	35.51	34.56
13	6.50	18.80	16.61	16.70	33.71	32.76	38.01	37.06
14	7.00	20.30	18.11	18.20	36.21			

Dry weight plant¹:

The data are presented in Table 3. The data indicate that mean total dry weight gradually increased upto 75 DAS. Rate of increase in mean total dry weight was fast till 60 DAS. The rate of increase in total dry weight slowed down from 60 DAS onwards. Mean total dry matter per plant exhibited significantly for lots, treatments and their interactions at all the stages of growth. Invigouration treatment IAA+NAA (10ppm, 6 hrs hydration) showed highest dry weight as compared to other treatments and control. Invigouration treatments and cultivar combinations showed significantly superior results. Similar results were also reported by Bhardwaj *et al.* (1963), Rao *et al.* (1976) and Maske *et al.* (1998) in soybean.

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