



P-ISSN: 2349-8528
 E-ISSN: 2321-4902
 IJCS 2018; 6(4): 41-43
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 Received: 10-05-2018
 Accepted: 12-06-2018

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Effect of plant growth regulators on growth seed yield and yield attribute of field Pea (*Pisum sativum* L.)

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Abstract

The present study was carried out with 10 treatment of Gibberlic acid and cycocel in Pea (*Pisum sativum* L.) and one check during *Rabi* 2017-2018 in RBD (Randomized Block Design) with three replications at Field Experimentation Center of the Department of Genetics and Plant Breeding, SHUATS, Allahabad. Analysis of variance showed highly significant differences among all treatment for all the morphological characters studied. The ANOVA revealed the presence of considerable variation among the treatment for all the characters. Analysis of variance showed highly significant differences among 10 treatment T5 (CCC 500 PPM) was best treatment in growth and seed yield like Field emergence (85.74) number of pod/plant (15.20), number of seed/pod (8.17) seed yield/plant (23.75gm) (CCC 500 PPM) was identified as best performance in seed physical character like pod length, pod width, number of seed per pod.

Keywords: Field pea, quantitative and quality character

1. Introduction

Field Pea (*Pisum sativum* L.) is one of the most important grain legume crops, and consumed fresh or canned food, and also dried pea grains are used to make soup after broken in human diet. As a rich source of proteins, carbohydrates and vitamins, peas are containing 18 to 28.4% rate of protein in dry grains. Green peas are good source of vitamins A, B and C. It has other important nutrients like fats, minerals, carbohydrates, riboflavin, iron, phosphorus, calcium, carotene etc. It forms an essential commodity for housewives in day to day preparation of spicy and tasty food. Pea (at 88.6% DM) contains 10.7 to 21.6 percent crude protein, 1.5 to 3.7 percent fat, 41.9 to 50.6 percent N-free extract. (Duke, 2005) [2]. Dried peas contain 22.9 percent protein, 1.4 percent fat, 60.7 percent carbohydrate, 1.4 percent crude fibre and 2.7 percent ash (Hulse, 2000) [3]. The use of plant growth regulators either as plant spray or as seed treatment has brought spectacular results in both yield and quality of many vegetable crops. The effects of plant growth regulators were influenced by light, temperature, moisture, nutrients and other environmental factors. The efficiency of plant growth regulators varies under different concentrations, methods of application and time of application. Earlier studies show that seeding rate and cultivar are important factors affecting yield and quality of grain legumes (Kibe and Kamithi, 2007; Shirtliffe and Johnston, 2002; Dahmardeh *et al.*, 2010) [7, 12, 4]. Some plant growth regulators like gibberellic acid promote the cell elongation and hasten the maturity of the plant. Sudden increase in area of peas in recent years has created an acute shortage supply of seeds and there is more difference between the production and total demand of seeds. Hence, to boost up the seed yield per unit area and to standardize the practice to be used for the higher production of pea seeds, the present investigation was undertaken on effect of plant growth regulators on growth, seed yield of pea (*Pisum sativum* L.) Green peas cultivation is highly labour-intensive like all other vegetable crops (Rao and Tripathi, 2001 and Khunt and Desai, 2003) [10, 8] and requires high dosages of manures and fertilizers.

2. Objective

1. To study the effect of individual and combined seed treatment of Gibberlic acid cycocel on growth and yield traits of field pea.

2. To identify the suitable treatment of Gibberelic acid and cycocel for Field Pea.

3. Material and Methods

The field experiment for the present investigation entitled "Effect of plant growth regulators on growth and seed yield on pea treatments with PGR and its duration on seed yield on pea (*Pisum sativum* L.) for yield and yield contributing traits" was conducted during Rabi-2017-2018 at field experimentation centre of Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, (U.P.). The field experimental setup was laid out in randomized block design (RBD) with 3 replications during the 2017-2018 growing season. Standard agronomic practices and plant protection measures were adopted as per schedule. Seed Treated with control, Distilled water, GA₃ (100 PPM), GA₃ (200 PPM), CCC (250 PPM), CCC (500PPM), GA₃ (100 PPM + CCC 500 PPM), GA₃ (100 PPM + CCC 250 PPM), GA₃ (200 PPM + CCC 500 PPM), GA₃ (200 PPM + CCC 500 PPM), seed slaked 12 hr after seed pack in bag sowing in the field under shade to assess the parameters. Field Emergence (%), first flowering, 50 per cent flowering, Height of plant (cm), Number of primary branches. Length of pod (cm), Breadth of pod (cm), Number of pods per plant, Number of seed per pod, Seed yield per plant (gm), Pod maturity day, Seed yield per plot (kg), 100 seeds weight (g), Seed yield per

ha Khan *et al.*, 2002^[9]; Bora and Sarma, 2003^[11]; Rahman *et al.*, 2004^[11] were recorded. The experimental data recorded were subjected to statistical analysis for calculating analysis of variance, range, and mean, critical Difference and coefficient of variation.

4. Results and Discussion

According to the results, all studied traits were affected by the treatments and there was completely significant difference between control and treated seeds (Table-1). All seedling characters *viz.* Field Emergence (%), first flowering, 50 per cent flowering, Height of plant (cm), Number of primary branches. Length of pod (cm), Breadth of pod (cm), Number of pods per plant, Number of seed per pod, Seed yield per plant (gm), Pod maturity day, Seed yield per plot (kg), 100 seeds weight (g), Seed yield per hac., (CCC 500 PPM) were affected by concentration and significantly recorded maximum. Significantly higher germination per cent (85.74) reported in treatment T₂ (GA₃ 100 PPM) followed by T₆ (GA₃ 100 PPM+CCC 500 PPM) 83.61, untreated with Minimum germination percent recorded by T₀ (76.10) with untreated seed control

Huttly and Phillips (2000)^[5] Table 2). It is reported that the earlier and better synchronized germination is associated with increased metabolic activities in the soaked seeds Rahman *et al.*, 2004^[11].

Table 4.1: Analysis of Variance for 14 characters of Pea

S. No	Characters	Mean sum of squares		
		Replication (d.f. =02)	Treatment (d.f. =9)	Error (d.f.=18)
1	Field emergence	2.816	25.688**	31.882
2	Day to first flowering	0.299	14.015*	3.926
3	Day to 50% flowering	1.233	3.792*	0.970
4	Number of primary branches per plant	0.015	0.499*	0.004
5	Number of pod per plant	475.333	1730.146*	490.878
6	Number of seed per pod	0.337	2.259*	0.570
7	Pod length (cm)	0.323	0.355*	0.077
8	Pod width (cm)	0.009	0.002*	0.000
9	Day to pod maturity	4.933	7.484*	2.973
10	100 Seed weight	0.361	6.875*	2.390
11	Plant height (cm)	29.489	122.634*	42.525
12	Seed yield per plant	0.047	19.071*	0.030
13	Seed yield per plot (kg)	0.013	0.179*	0.010
14	Seed yield q/hac	0.605	29.665*	0.533

*Significant at 5% level of significance

** Significant at 5% level of non-significance

Table 4.2: Mean Performance 14 characters of Field Pea

Treatments	Field emergence	Day to first flowering	Day to 50% flowering	Number of primary branches/plant	Number of pod / plant	Number of seed/pod	Pod length (cm)	Pod width (cm)	Day to pod maturity	100 Seed weight (g)	Plant height (cm)	Seed yield/plot (g)	Seed yield/plot (kg)	Seed yield q/hac
T ₀	76.10	30.00	39.33	3.44	9.53	5.82	7.21	1.79	102.00	18.38	72.93	16.36	1.39	19.25
T ₁	81.79	33.00	39.00	3.37	8.00	5.52	7.64	1.83	105.00	20.31	90.20	16.82	1.50	20.20
T ₂	85.16	33.66	38.00	3.64	12.33	6.57	7.72	1.83	104.66	22.58	82.40	21.38	1.56	25.35
T ₃	81.69	29.00	37.00	3.84	13.46	6.21	7.59	1.81	106.00	20.64	92.53	22.20	2.03	26.73
T ₄	79.90	30.66	39.00	4.24	12.93	6.10	7.99	1.83	103.00	21.58	85.80	17.72	1.56	21.24
T ₅	85.74	32.66	37.33	4.52	15.20	8.17	8.45	1.93	101.66	22.74	96.20	23.75	2.13	28.51
T ₆	83.61	29.00	39.66	4.09	13.40	6.43	7.81	1.78	105.33	20.36	90.33	18.67	1.75	23.67
T ₇	81.47	35.00	37.33	4.31	11.73	7.20	7.74	1.82	102.00	23.56	88.20	19.71	1.65	22.41
T ₈	83.51	32.66	38.66	4.44	11.20	7.54	7.81	1.86	104.33	22.04	86.86	21.05	1.53	20.73
T ₉	79.00	29.33	36.33	3.91	10.33	7.60	8.23	1.83	102.66	20.69	83.93	17.26	1.83	26.16
Grand Mean	81.80	31.49	38.16	3.98	19.81	6.718	7.82	1.83	103.66	21.29	86.93	19.49	1.69	23.42
S E	1.08	1.47	4.20	0.02	1.42	0.22	0.46	1.42	1.42	2.09	0.70	0.11	0.08	0.01
CD 5%	NS	3.40	1.69	0.06	38.00	1.30	0.45	0.07	2.95	2.65	11.18	0.33	0.23	1.25
CV	6.90	6.29	2.58	0.96	111.82	11.31	3.40	2.46	1.66	7.26	7.50	1.01	8.12	3.11
Max	85.74	35	39.66	4.52	88	8.17	8.45	1.93	106	23.56	96.2	23.75	2.13	28.51
Min	76.10	29	36.33	3.37	9.53	5.52	7.21	1.78	101.66	18.38	72.93	16.36	1.39	19.25

The result show the givin of field emergence ranged from 4, 7, 10 days after sowing 76.10 to 85.74 with average 81.80%. The treatment T0 Control exhibited minimum plant height (76.10%) and treatment T5 CCC 500 PPM exhibited high field emergence (85.74%) Huttly and Phillips (2000) ^[5]. Days to first flowering ranged from 29 to 35 with mean value of 31.49. The treatment T6 [GA3 100 PPM+CCC 500 PPM] exhibited early days to first flowering (29) where as treatment T7 [GA3 100 PPM+CCC 250 PPM] exhibited late days to first flowering (35). Days to 50% flowering ranged from 36.33 to 39.66 with mean value of 38.16. The treatment T9 [GA3 200 PPM+CCC 250 PPM] exhibited early days to 50% flowering (36.33) where as treatment T6 [GA3 100 PPM+CCC 500 PPM] exhibited late days to 50% flowering (39.66). Number of primary branches per plant ranged from 3.37 to 4.52 branches with the mean value of 3.98 branches. The maximum number of primary branches per plant was recorded in treatment T5 CCC 500 PPM (4.52 branches), while minimum number of primary branches per plant was recorded in treatment T1 Distilled water (3.37 branches). Number of pods per plant ranged from 9.53 to 15.20 pods with the mean value of 11.81 pods. The maximum number of pods per plant was recorded in treatment T5 [CCC 500 PPM] (15.20 pods), while minimum number of pods per plant was recorded in treatment T0 [Control] (9.53 pods). Number of seeds per pod ranged from 5.52 to 8.17 with the mean value 6.71. The maximum number of seeds per pod was recorded in treatment T5 [CCC 500 PPM] (8.17), while minimum number of seeds per pod was recorded in treatment T1 [Distilled water] (5.52) (Rahman *et al.*, 2004) ^[11]. Pod length ranged from 7.21cm to 8.45 cm with the mean value of 7.82 cm. The maximum pod length was recorded in treatment T5 [CCC 500 PPM] (8.45cm), while minimum pod length was recorded in treatment T0 [control] (7.21cm). Pod width ranged from 1.78cm to 1.93cm with the mean value of 1.83cm. The maximum pod width was recorded in treatment T5 [CCC 500 PPM] (1.93cm), while minimum pod width was recorded in treatment T6 [GA3 100 PPM+CCC 500 PPM] (1.78cm). Days to maturity ranged from 101.66 to 106.00 days with the mean value 103.66 100 seed weight ranged from 18.38 to 23.56 (g) with the mean value of 21.29 (g). The maximum value for 100 seed weight was recorded in treatment T7 [GA3 100 PPM+CCC 250 PPM] (23.56g), while minimum value for 100 seed weight was recorded in treatment T0 [Control] (18.38g). Plant height ranged from 72.93cm to 96.2 cm with the mean value of 86.93cm. The minimum plant height was exhibited by treatment T0 (72.93cm), while maximum plant height was recorded for treatment T5 (96.2cm). The perusal of data for this important character revealed that seed yield per plant ranged from 16.36 to 23.75g with the mean value of 19.49g Khan *et al.*, 2002 ^[9]. The highest yielding treatment was T5 (23.75g) and treatment T0 (16.36g) was the lowest yielder among the all treatments. The seed yield per plot ranged from 1.39kg to 2.13kg with the mean value of 1.69kg. The highest yielding treatment was T5 (2.13kg) and treatment T0 [control] (1.39kg) was the lowest yielder among the all treatments. Seed yield q/hac ranged from 19.25q to 28.51q with the mean value of 23.42q. Highest Seed yield q/hac was exhibited by treatment T5 (28.51q), while lowest Seed yield q/hac was exhibited by treatment T0 [control] (19.25q).

5. Conclusion

It was concluded from the present study that the treatment T5 (CCC 500) PPM was identified as best treatment improved

growth and yield attribute of traits on field Pea. (*Pisum sativum* L).

6. Acknowledgements

The authors are thankful to all the members of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, U. P., for providing all necessary facilities and support.

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