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Pre-Sowing Seed Treatments of Panchagavya and Plant Growth Regulators on Growth, Yield and Yield Attributing Traits of Field Pea (*Pisum sativum* L.) Variety-IPF (4-9)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was conducted during rabi 2020 at Crop Research Farm, Department of Genetics and Plant Breeding, SHAUTS, PRAYAGRAJ, (U.P.). The experiment was laid out in Randomized Block Design and comprised of 13 treatments and 3 replications. The treatments which are T_0 -Control, T_1-Panchagavya 3%, T_2-Panchagavya 5%, T_3- Panchagavya 5%, T_4-Panchagavya 5%, T_5- Gibberellic acid 10 ppm for 6 hours, T_6-Gibberllic acid 10ppm for 12 hours, T_7- Gibberellic aid 15ppm for 6 hours, T_8-Gibberlic acid 15 ppm for 12hours, T_9-IAA at 50 ppm, T_{10}-IAA at 100 ppm, T_{11}-NAA at 50 ppm, T_{12}-NAA at 100 ppm used. The result showed that viz., Field emergence, Plant height 90 DAS, Days to 50% flowering, Number of branches, Days to maturity, Number of pods per plant, Number of seed per pod, Seed yield per plant (gm), Biological yield (gm), Seed index (gm) and Harvest index were recorded significantly highest in the treatment of T_8-

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Gibberllic acid 15 ppm for 12 hours and the least performance was observed in T_0-Control when compared to other treatments. Hence, the seed treatment of Gibberellic acid 15ppm for 12hours could be recommended for the Field Pea.

Keywords: Field pea; panchagavya; plant growth regulators.

1. INTRODUCTION

Cereal pulses conquer an important role in the Indian economy. Pulses perform a major role in vegetarian nutrition in India and constitute about 20% of our body mass. Field pea (*Pisum sativum* L.) fits to the Genus Pisum, family Fabaceae and sub- family Papilionaceae with chromosome number (2n = 2x = 14) and self-pollinating in nature. It is an annual herbaceous plant utilizes the taproot system.it is broadly grown as *rabi* pulse crop. It is one of the main pulse crop grown universally and second highest grain yielding legume crop next to *vicia fabia* and native to Mediterranean region. The crop was also widely grown in Russia and China [1].

In India field pea is vastly grown in the states of Uttar Pradesh, Bihar, Madhya Pradesh, Haryana, Punjab and Maharashtra. Field Pea occupies an area of 73 Lakhs ha with production of 63 lakh tons and productivity of 849 kg ha^{-1} in India (FAOSTAT, 2013). Green peas are good source of vitamins (A, B, C) and have high levels of amino acids, lysine and tryptophan. Pea contains 10.7 to 21.6 per cent crude protein, 1.5 to 3.7 per cent fat, 41.9 to 50.6 per cent N-free extract. Dried peas contain 22.9 per cent protein, 1.4 per cent fat, 60.7 per cent carbohydrates, 1.4 per cent crude fibre and 2.7 per cent ash.

Field pea is a important pulse crop of India having high economical and nutritive quality. It is also called as poor man's meat due to its high protein, vitamin and minerals and reasonably available for consumers [2].

The impact of plant growth regulators in manipulating physiological processes in crop production include germination, vigour, nutrient uptake from soil, photosynthesis, respiration, portioning of assimilate, growth suppression, defoliation and post-harvest ripening [3].

In the hormonal priming gibberellin (GA3) and indole acetic acid (IAA) control different developmental processes in plants. IAA act early during shoot initiation and control meristem activity, while GA3 are responsible for expansion and cell division in shoot elongation, flowering and seed germination [4].

panchagavya helps to preserve the quality of crops, soil and environment as well.it has also been reveal ed that as compared to chemical fertilizers, panchagavya is less expensive and more eco-friendly with no side effects [5].

Moreover, growth stimulators such as NAA can be useful in reducing the flower loss and enhancing the transition into the reservoir [6].

Seed pre- sowing treatment will modify the physiological and biochemical nature of seeds, so as to get the characters that are favorable for drought tolerance although.

It varies from crop to crop, the principle remains same.it also results in enhanced mitochondrial activity leading to the formation of high energy compounds and vital biomolecules. Hence, the present study was planned to determine the effect of pre-sowing seed treatments of panchagavya and plant growth regulators on growth, yield and yield attributing traits of field pea (*Pisum sativum* L*.).*

2. MATERIALS AND METHODS

The present Field experimentation was carried out during rabi season 2020-2021 in the field research Centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj. Situated at a Latitude of 25.87°N and 81.5°E Longitude. The soil of the Research farm has a pH of 7.0 to 8.0, sandy loam in texture with minimum water holding capacity. The experiment was carried in Randomized block design in three replications comprising of 13 treatments on field pea. The crop was sown at a spacing of 30 X 10 cm.

2.1 Treatment Details

T0-control,
T1- 3% Panchagavya for 12 hrs
T2- 5% Panchagavya for 12 hrs
T3-7% Panchagavya for 12 hrs

T4-9% Panchagavya for 12 hrs
T5-10 ppm Gibberellic acid for 6 hrs
T6-10 ppm Gibberellic acid for 12 hrs
T7-15 ppm Gibberellic acid for 6 hrs
T8-15 ppm Gibberellic acid for 12 hrs
T9-50 ppm IAA for 12 hrs
T10-100 ppm IAA for 12 hrs
T11-50 ppm NAA for 12 hrs
T12-100 ppm NAA for 12 hrs

2.1.1 Field emergence (%)

Field emergence (%) = (Number of seedlings emerged on 15th day / Total no. of seeds sown) ×100

2.1.2 Plant height (cm)

It was measured from ground level to the base of the top most fully opened leaf at 30,60 and 90 DAS. Average height of five plants was recorded in centimetres.

2.1.3 Days to 50 % Flowering

It will measure from DAS to half flowering, in which observe select five plants in a plot and check flowering status when 50 % flower open in field.

2.1.4 Number of branches per plant

The total numbers of branches from five randomly selected plants were counted manually from each treatment.

2.1.5 Days to maturity

The numbers of days required from sowing to the full maturity from five randomly selected plants in each replication were be recorded as days to maturity.

2.2 Post Harvest Observations

2.2.1 Number of pods per plant

The total numbers of pods from five randomly selected plants were counted manually from each treatment.

2.2.2 Number of seeds per pods

The total numbers of seeds in per pod from five randomly selected plants were counted manually from each treatment.

2.2.3 Seed yield per plant (gm)

The seed weight of five randomly select plants were be recorded of each plot.

2.2.4 Seed yield per plot (gm)

The total number of seeds obtained in all plants in that particular plot

2.2.5 Biological yield

The biological yield refers to the total dry matter accumulation of a plant system. The biological yield of five randomly select plants were be recorded of each plot.

2.2.6 Seed index

The weight of randomly selected 100 seeds from observational plant were be measured in grams.

2.2.7 Harvest index

For grain crops, harvest index (HI) is the ratio of harvested grain to total shoot dry matter, and this can be used as a measure of reproductive efficiency. The HI of five randomly select plants were be recorded of each plot.

The experiment was conducted to study the pre-sowing seed treatments of Panchagavya and Plant growth regulators on growth, yield and yield attributing traits of Field pea (*Pisum sativum* L.*)* variety-IPF 4-9. Observations recorded for Growth characters viz., Field emergence [6], Plant height at (30,60,90 DAS), Days to 50% Flowering, Number of branches, Days to Maturity. Yield parameters like Number of pods per plant, Number of seeds per plots, Seed yield per plant (gm), Seed yield per plot (gm), Biological yield (gm), Seed index (gm), Harvest index. Field Experimentation mean performance and Analysis of variance was analysed statistically using the technique designated by Panse and Sukhatme (1967).

3. RESULTS AND DISCUSSION

Hence, a study was formulated to evaluate the effect of pre-sowing seed treatment of Panchagavya and plant growth regulators on growth, yield and yield attributes in field pea. Field pea IPF-49 were treated with various seed treatment i.e., Panchagavya @ 3%, 5%, 7%, 9% at 12 hours, Gibberellic acid @ 10 ppm at 6 hours and 12 hours, Gibberellic acid 15 ppm at 6

hours and 12 hours and IAA @ 50,100 ppm at 12 hours, NAA @ 50, 100 ppm at 12 hours. The treated seeds were evaluated on their seed qualities and productivity using untreated seeds as control. The improvement in growth, yield and yield characters with Gibberellic acid due to the action of growth hormone and yield.

The above primed seeds were also evaluated under field condition the growth, yield and yield characters were observed pre sowing seed treatment in Table 1, 15 ppm at 12 hours in Gibberellic acid recorded higher values for the growth traits Field emergence, plant height (90DAS), Number of branches, which were (87.33%, 108.37cm, 10.93). The early days to maturity and days to 50% flowering was recorded in Gibberellic acid @ 15ppm at 12 hours (115.93, 64.67).

Increase in field emergence may be due to the higher metabolic activity before sowing due to pre-sowing seed treatment that caused seeds gets ready for germination as soon as sown. The above results obtained were in line with different scientists conducted the research in different crops, similar results were observed by Kumar and Sundareswaran [7]. GA3 effectively increased the vegetative growth of pea plant, this is due to that GA_3 can promote the cell division and cell elongation; Similar results were found by Kalariya et al. [8]. Gangaraju et al. [9] also observed the highest number of branches with the application of GA_3. The variation in the number of branches might be due to the vigorous growth of the plants due to the priming. Devi et al., [10] obtained similar results in terms of maturity when seeds were treated with 5 ppm GA_3.

In Table 2, This treatment was also recorded the higher yield attributes characters such as Number of pods per plant, Number of seeds per plant, Seed yield per plant (gm), Biological yield (gm), Seed index (gm), Harvest index (%), which were (24.06, 5.89, 33.46gm ,40.70gm, 23.53gm, 80.39%) higher than control respectively with the above-mentioned characters.

Table 1. Mean performance of growth attributes in different pre-sowing seed treatments in field pea

Sr. No.	Treatments	Field emergence	Plant height at 90 DAS (cm)	Days to 50% flowering	Number of branches	Days to maturity
1	T_0 -Control	73.00	93.24	72.30	6.67	122.51
2	Panchagavya 3%	77.33	96.63	72.00	8.03	121.47
3	Panchagavya 5%	78.00	96.84	71.13	7.73	121.87
4	Panchagavya 7%	79.00	96.84	70.73	8.12	121.60
5	panchagavya 9%	85.67	105.71	66.07	9.74	116.80
6	Gibberellic acid 10 ppm 6 h	77.00	99.21	71.33	6.80	120.00
7	Gibberellic acid 10 ppm 12 h	76.33	100.90	69.47	7.47	122.13
8	Gibberellic acid 15 ppm 6 h	81.67	104.53	67.40	9.64	117.80
9	Gibberellic acid 15 ppm 12 h	87.33	108.37	64.67	10.93	115.93
10	IAA 50 ppm	76.00	97.80	71.47	8.64	122.13
11	IAA 100 ppm	76.00	97.14	70.53	7.87	122.00
12	NAA 50 ppm	74.67	96.55	71.33	7.87	122.07
13	NAA 100 ppm	76.67	100.90	71.47	7.07	120.93
Mean		78.36	99.34	70.03	8.20	120.56
Sem		1.08	1.41	0.38	0.73	1.31
SEd		1.52	1.99	0.71	1.02	1.84
CD(p=0.05)		3.14	4.12	1.47	2.10	3.79
CV		2.38	2.46	1.24	15.18	1.87

Table 2. Mean performance of yield attributes in different pre-sowing seed treatments infield pea

Sr. No.	Treatments	Numbers of pods per plant	Numbers of seeds per pod	Seed yield per plot (gm)	Biological yield (gm)	Seed index (gm)	Harvest index (%)
1	T_0 -Control	20.00	4.33	350.67	29.57	21.84	73.01
2	Panchagavya 3%	20.87	4.93	379.33	32.87	22.02	75.46
3	Panchagavya 5%	21.27	5.13	469.00	33.74	21.84	75.88
4	Panchagavya 7%	20.87	4.97	462.33	32.87	22.15	75.64
5	panchagavya 9%	23.60	5.80	538.33	39.26	23.44	79.71
6	Gibberellic acid 10 ppm 6h	22.00	4.93	461.33	35.61	22.12	76.07
7	Gibberellic acid 10ppm 12h	21.60	5.00	501.00	31.85	21.92	75.88
8	Gibberellic acid 15ppm 6h	22.53	5.47	535.67	37.21	23.11	78.19
9	Gibberellic acid 15ppm 12h	24.06	5.89	551.00	40.70	23.53	80.39
10	IAA 50ppm	21.60	5.20	502.33	34.73	22.16	76.46
11	IAA 100ppm	21.80	5.26	512.33	34.67	21.95	77.01
12	NAA 50 ppm	21.47	4.93	503.00	33.37	21.93	75.21
13	NAA 100 ppm	21.13	4.67	483.33	39.26	22.01	74.49
Mean		21.77	5.12	480.74	34.58	22.31	76.42
SEm		0.71	0.20	5.58	1.44	0.21	0.99
Sed		1.00	0.29	7.89	2.03	0.30	1.40
CD(p=0.05)		2.06	0.59	16.29	4.20	0.61	2.90
CV		5.61	6.83	2.01	7.20	1.63	2.25

Due the seed treatment of Gibberellic acid 10 ppm for 12 hours resulted in higher number of pods. Similar results were observed by Gangaraju et al., [9], the number of pods increases which results in an increase in yield and ultimately enhance the productivity by preventing the flower drop and pods shedding in chickpea. The results were found to similar with Mzid et al., (2011).

4. CONCLUSION

It can be concluded that from above study seed priming improving germination, vigour, growth and yield of field pea. Treated seeds performed better than untreated seeds control of all the treatments seed priming with GA_3@ 15ppm at 12 hours recorded best results with significantly followed by Panchagavya @ 9 %for 12 hours.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kulsumbi AK, Sangeeta IM, Shakuntala NM, Vasudevan SN, Kisan B. Study on the effect of seed priming on Physiological and Biochemical changes in seed quality of Spinach (*Spinacia oleracea* L.). Research Journal of Pharmacognosy and Phytochemistry. 2020;12(2):65-70.
2. Amarakoon D, McPhee K, Thavarajah P. Iron-, zinc-, and magnesium-rich field peas (*Pisum sativum* L.) with naturally low phytic acid: A potential food-based solution to global micronutrient malnutrition. Journal of Food Composition and Analysis. 2012;27(1):8-13.
3. Kathiresan G, Balasubramanian TN. Influence of growth regulatory substance on the germination of clip and single budded sets of different age cane. Cooperative Sugars. 2005;26:695-699.

4. Pallaoro DS. Priming corn seeds with plant growth regulator. Journal of Seed Science. 2016;38:227–232.
5. Biswas, Pait M. Panchagavya can replace chemical fertilizers and pesticides in agriculture, The Arunachal Times; 2015.
6. Prakash M, Saravanan K, SunilKumar B, Jayaclesan S, Ganesan J. Effect of plant growth regulators and micronutrients on yield attributes of sesame. FAO, Sesame and Safflower Newsletter. 2003;18:188.
7. Kumar VA, Sundareswaran S. Effect of foliar application of chemicals and growth regulators on growth and seed yield in coriander (*Coriandrum sativum* L.,) Progressive Horticulture. 2011;43:193-95.
8. Kalariya VD, Pamar VK, Patel NM, Sanket M. Impact of Seed Treatment of Plant Growth Regulators on Seed Germination and Growth of Okra (*Abelmoschus esculentus* L.) Moench) CV, GAO-5, An International Refereed, peer reviewed & Indexed Quarterly Journals. 2016;5(15):305-308.
9. Gangaraju N, Balakrishna P, Siddaraju R, Parashivamurthy. Effect of Pre-Sowing Seed Treatment with Plant Growth Regulators on Crop Growth Parameters of Blackgram (*Vigna mungo.* L. Hepper). International Journal of current Microbiology and Applied Sciences. 2019;8(12):199-207.
10. Devi K, Purna KB, Barua M. Integrated effect of pre-sowing seed treatment, sowing windows and seasons on seed yield and quality of Greengram. Legume Research an International Journal; 2019. ISSN: 0976-0571.

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