EVAULATION OF SEED PRIMING ON GROWTH OFCHICKPEA (*Cicer arientinum*L.)

ABSTRACT

The present experiment was conducted during Rabi 2019 at experimental field of Pulses Research unit, Dr. PDKV, Akola to assess the suitable priming treatment for chickpea crop (variety: JAKI-9218). The experiment was laid out in randomize block design in three replication. The morpho-physiological traits viz. germination %, plant height, number branches, dry matter content, number of day required to 50% flowering were taken.. The morpho-physiological i.e. plant height, number of branches, dry matter content, germination % showed significant increased in chickpea crop when seed priming was carried out with potassium nitrate for 4 hours. The numbers of days required to 50% flowering were recorded least in seed priming GA3 for 4 hours. Protein content also recorded significantly higher in seed priming with potassium nitrate for 4 hours. Yield and yield attributes were also significantly increased in seed priming with potassium nitrate for 4 hours. It is concluded that seed priming were with potassium nitrate for 4 hours recorded higher morpho-physiological characters over priming treatment and control.

Keywords*: Seed priming, Germination, Growth parameters. GA3, Potassium nitrate*

INTRODUCTION

There are about 60 domesticated grain legume species in the world [1]. The chickpea is fifth most important legume in the world, on the basis of total production after soybean, groundnut, beans and peas [2]. Chickpeas also known as garbanzo beans, grams or Bengal gram, Egyptian pea, chana and chole. In India it is largest growing pulse crop. Botanical name of chickpea is *Cicerarietinum* L. The genus Cicer belongs to the family Leguminosae, sub family Fabaceae of the tribe Vicieae. The somatic chromosome number of chickpea is 2n=16. The genus Cicer contains about 40 species out of which 31 are perennial and 9 are annual. Chickpea probably originated from south east Turkey. Four centers of diversity were identified in the Mediterranean, central Asia, the East and India, as well as a secondary centers of origin in Ethiopia [3].

Seed priming is a process of controlled hydration of seeds to a level that permits pre-germination metabolic activity to proceed, but prevents actual emergence of the radicle. Benefits of seed priming

includes, faster speed of emergence, enable seed to germinate and emerge even under adverse agro-climatic conditions, improve uniformity to optimize harvesting efficiency, increases shelf life of seeds, improves the resistance towards water and temperature stress, increase vigour for fast and strong plant development and increases yield potential.

Seed priming technique has been practiced in many countries including Pakistan, China and Australia and more than thousand trials has been conducted to evaluate the performance of priming in variety of crops. Fifty three farmers tested maize seed priming in kharif season in 1996 in tribal areas of Rajasthan, Gujarat and Madhya Pradesh; India (Harris et al. 1999). Almost all farmers thought that primed crops grew more vigorously, flowered and matured earlier and produced bigger cobs and higher yield. Independent measurements on a subset of 35 trials showed a mean increase in cob weight of 6% [3].

Seed priming have various techniques for improving the performance of the growth, emergence and yield of the crop. There are some techniques which are used i.e. hydro-priming, halo-priming, osmo-priming and hormonal priming.

MATERIALS AND METHODS

A field experiment was conducted at Pulses Research Unit, Dr. PanjabraoDeshmukhKrishiVidyapeeth, Akola and analytical work of the experiment was carried out at Analytical laboratory, University Department of Agricultural Botany, Dr. PanjabraoDeshmukhKrishiVidyapeeth, Akola during the year 2019-20.The experiment was conducted in randomized block design.which is replicated three (3) times on a gross plot. Twelve (12) treatments involving 100 seeds per trail used forhydro-priming, halo-priming, osmo-priming and hormonal priming for 4 hours were used, which include:T1:Control, T2:Hydro priming, T3:Priming with 0.5% urea, T4:Priming with 1% urea, T5:Priming with 0.5% Ammonium sulphate, T6:Priming with 1% Ammonium sulphate, T7:Priming with 0.5% KNO3, T8:Priming with 1% KNO3, T9:Priming with 50 ppm GA3, T10:Priming with 100 ppm GA3, T11:Priming with 50 ppm chlormequat chloride and T12:Priming with 100 ppm chlormequat chloride.

Field emergence and germination percentage

Field emergence was counted on the experimental plot. Emergence count was under taken on 8^{th} day after sowing and was counted and noted for each plot and replications.

Growth Parameters

Plant height (cm)

Observations on plant height were recorded (cm) at 30, 60, and 90DAS. The height of the three observational plants from each treatment and replication was recorded with scale from the base of a plant to top most developing node. From these plants of each treatment, mean height was calculated and recorded.

Number of branches

The number of branches counted at 30, 60, 90 DAS and at harvest.

Dry matter production studies

For dry matter study, single plant from each treatment and replication was uprooted periodically at flowering, pod formation and at harvest. The plant samples were washed with tap water carefully in order to remove soil and dust particles adhered to it. The samples were allowed to dry at room temperature separately for 48 hrs. The plant samples were then placed in the big size brown paper perforated bags. After drying the sample on open air basis, the plant sample was finally dried in hot air oven at $70^{O}C$ up to achieving the constant weight. The average total dry matter was recorded (g/plant) genotype and replication wise.

Number of days required to 50% flowering

The day on which 50% plants from the plot found bloomed was noted and recorded. Thus, total number of days required for flowering of 50% plants, from date of sowing were counted and expressed as days to 50% flowering.

Data analysis

The analysis of variance was performed to get the significance of differences between the treatments for all the characters as per the methodology suggested by Panse and Sukhatme (1967) [4]. The 'F' test whenever revealed significant, the critical differences were worked out at 5% level of significance for comparisons.

RESULTS AND DISCUSSION

EFFECT OF SEED PRIMING ON SEED GERMINATION AND GERMINATION PERCENTAGE OF CHICKPEA.

Table 1. Effect of seed priming on germination of chickpea

Treatments	Germination per plot	Germination (%)
T1: Control (no seed priming)	198	70.71

T2: Seed priming with normal water	233	83.33
T3: Seed priming with 0.5% urea	239	85.48
T4: Seed priming with 1.0% urea	241	86.07
T5: Seed priming with 0.5% Ammonium sulphate	244	87.02
T6: Seed priming with 1.0% Ammonium sulphate	242	86.55
T7: Seed priming with 0.5% potassium nitrate	251	89.64
T8: Seed priming with 1.0% potassium nitrate	249	88.81
T9: Seed priming with GA3 50 ppm	239	85.24
T10 Seed priming with GA3 100 ppm	244	87.14
T11: Seed priming with Chlormequate chloride 50 ppm	241	86.07
T12: Seed priming with Chlormequate chloride 100 ppm	240	85.60
S.E. (m)+	8.46	3.02
CD@5%	24.8	8.86

The seed germination is important factor is directly affecting the yield of the crop showed in Table 1.The seed germination of chickpea was influenced significantly. The significantly higher seed germination (251 per plot) of chickpea was recorded in seed priming with 0.5 % potassium nitrate. The lowest seed germination of chickpea (198 per plot) was recorded in control (no seed priming). The seed germination is higher in seed priming as compared to control. Also the germination percentage of chickpea crop was influenced significantly. Significantly higher germination percentage (89.6%) was recorded in seed priming with 0.5 % potassium nitrate. The lowest germination percentage (70.7%) were recorded in control (no seed priming).

The higher germination per plot and germination percentage in seed priming with 0.5 % potassium nitrate might be due to stimulated hypocotyl growth, increased cell elongation resulting in faster emergence and positive effect on germination. Similar observations were recorded by [5] in chickpea, [6], [7] in chickpea and [8] in onion.

EFFECT OF SEED PRIMING ON HEIGHT OF CHICKPEA

Table 2. Effect of seed priming on plant height (cm) 30, 60, 90 DAS

Treatment	30 DAS	60 DAS	90 DAS
T1: Control (no seed priming)	17.1	27.2	34.4
T2: Seed priming with normal water	18.8	31.7	37.3
T3: Seed priming with 0.5% urea	19.4	35.3	38.4
T4: Seed priming with 1.0% urea	19.3	34.2	38.5

T5: Seed priming with 0.5% Ammonium sulphate	19.0	34.7	37.5
T6: Seed priming with 1.0% Ammonium sulphate	19.3	33.1	38.0
T7: Seed priming with 0.5% potassium nitrate	21.1	35.4	39.7
T8: Seed priming with 1.0% potassium nitrate	23.7	35.8	39.8
T9: Seed priming with GA3 50 ppm	19.2	32.3	38.2
T10 Seed priming with GA3 100 ppm	20.3	35.0	38.6
T11: Seed priming with Chlormequate chloride 50 ppm	18.9	29.7	37.5
T12: Seed priming with Chlormequate chloride 100 ppm	18.2	29.8	36.6
S.E. (m)+	**1.125**	**1.8**	**0.803**
CD@5%	**3.3**	**5.51**	**2.36**

The plant height (cm) was recorded 30, 60, 90 DAS and data is presented in table 2. Data pertaining to plant height of chickpea revealed that seed priming with 1.0 % potassium nitrate showed significantly higher (23.7 cm) plant height at 30 DAS, (35.8cm) at 60DAS and (39.7cm) at 90DAS. The lowest plant height was recorded in control (no seed priming) i.e. 17.1cm, 27.2cm, 34.4cm at 30, 60, 90DAS respectively.Plant height is important morphological parameter exhibiting direct relationship with grain yield. It is a visible measure of plant growth and is a function of leaf emergence and inter-nodal elongation. Since leaves and branches born on stem, leaf area development and biomass production shows close relationship with plant height. The effect of seed priming on plant height showed rapid increase in plant height over no seed priming (control). The enhancement of chickpea plant primed with 1% potassium nitrate might be due to increased cell division and seedling roots. Similar observations were recorded by [7] and[9] and [10].

EFFECT OF SEED PRIMING ON NUMBER OF BRANCHES OF CHICKPEA

Table 3. Effect of seed priming on number of branches

Treatment	30 DAS	60 DAS	90 DAS	At harvest
T1: Control (no seed priming)	2.3	6.3	10.0	10.3
T2: Seed priming with normal water	2.3	7.3	12.0	12.0
T3: Seed priming with 0.5% urea	2.7	7.7	12.7	12.7
T4: Seed priming with 1.0% urea	3.0	7.0	12.3	12.7
T5: Seed priming with 0.5% Ammonium sulphate	3.3	8.0	12.0	12.7

T6: Seed priming with 1.0% Ammonium sulphate	3.7	8.3	12.7	12.7
T7: Seed priming with 0.5% potassium nitrate	4.3	9.3	14.0	14.0
T8: Seed priming with 1.0% potassium nitrate	5.7	11.7	14.3	14.3
T9: Seed priming with GA3 50 ppm	3.7	8.3	13.7	13.7
T10 Seed priming with GA3 100 ppm	3.7	8.3	12.7	13.0
T11: Seed priming with Chlormequate chloride 50 ppm	5.3	10.0	14.0	14.0
T12: Seed priming with Chlormequate chloride 100 ppm	3.7	9.3	13.0	13.0
S.E. (m)+	**0.7**	**1.05**	**1.44**	**0.5**
CD@5%	**2.14**	**3.08**	**4.25**	**1.6**

The number of branches was recorded at 30, 60, 90 DAS and at harvest of chickpea. The data is presented in table 3. The data recorded number of branches significantly higher in seed priming with 1.0% potassium nitrate (5.7) at 30DAS, (11.7) at 60DAS, (14.3) at 90DAS and (14.3) at harvest. The lowest number of branches recorded in control (no seed priming) and seed priming with normal water.The treatment seed priming with 1% potassium nitrate showed significantly higher number of branches by 38.8% over control. Similar increases in number of branches of potassium primed were observed by [11] in chickpea.

EFFECT OF SEED PRIMING ON DRY MATTER CONTENT OF CHICKPEA

Table 4. Effect of seed priming on dry matter content (g) at 30, 60, 90 DAS

Treatment	30 DAS	60 DAS	90 DAS
T1: Control (no seed priming)	2.0	12.1	27.3
T2: Seed priming with normal water	2.5	12.8	27.4
T3: Seed priming with 0.5% urea	2.8	12.8	28.2
T4: Seed priming with 1.0% urea	2.6	13.5	30.8

T5: Seed priming with 0.5% Ammonium sulphate	2.7	13.6	30.9
T6: Seed priming with 1.0% Ammonium sulphate	2.6	13.8	31.5
T7: Seed priming with 0.5% potassium nitrate	3.0	14.5	32.5
T8: Seed priming with 1.0% potassium nitrate	3.2	14.9	33.7
T9: Seed priming with GA3 50 ppm	2.8	13.3	29.6
T10 Seed priming with GA3 100 ppm	2.6	13.5	30.3
T11: Seed priming with Chlormequate chloride 50 ppm	2.8	12.9	28.8
T12: Seed priming with Chlormequate chloride 100 ppm	3.0	14.3	31.8
S.E. (m)+	**0.201**	**0.545**	**1.244**
CD@5%	**0.59**	**1.6**	**3.65**

The dry matter content of chickpea was recorded at 30, 60 and 90 DAS. The data pertaining to dry matter content of chickpea reported in table 4.The dry matter content of chickpea was significantly increased due to seed priming treatment over control (no seed priming). Significantly higher dry matter content of chickpea (3.2gm) at 30 DAS, (14.9gm) at 60DAS, (33.7gm) at 90DAS was recorded in seed priming with 1.0% potassium nitrate. Lowest dry matter content of chickpea (2.0gm) at 30DAS, (12.1gm)at 60DAS, (27.3gm) at 90 DAS was recorded in control (no seed priming).

Plant dry matter content is the consequence of plant physiological and biological activity. Result of plant dry matter content of different seed priming treatments were found significant at 30, 60 and 90DAS. The highest dry matter content was recorded in seed priming with potassium nitrate. Similar observations were recorded by [7] and [10].

EFFECT OF SEED PRIMING ON NUMBER OF DAYS REQUIRED FOR 50% FLOWERING

Table 5. Effect of seed priming on number of days required for 50% flowering

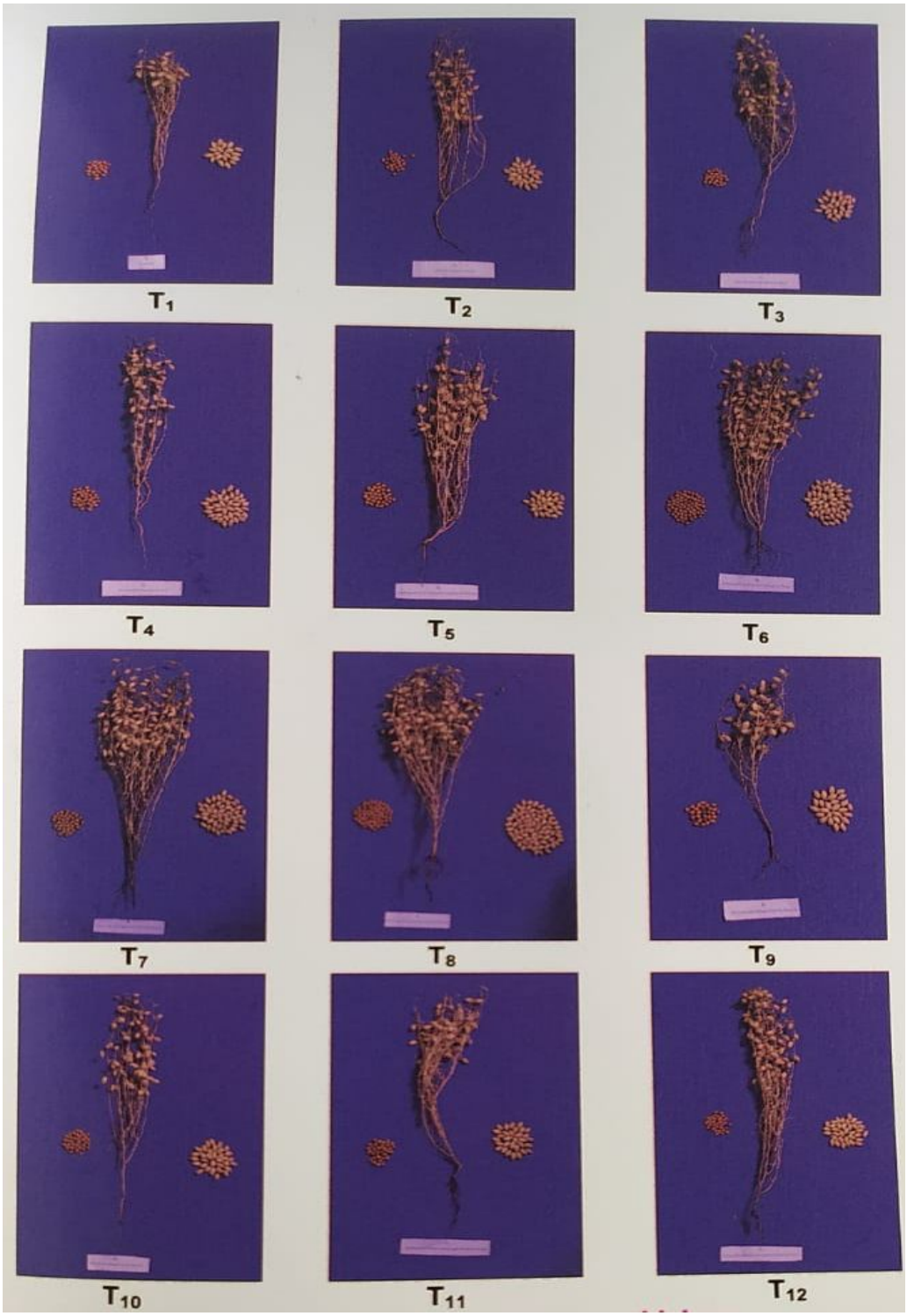
Treatment	No of days required for 50% flowering
T1: Control (no seed priming)	50.6
T2: Seed priming with normal water	49.7

T3: Seed priming with 0.5% urea	49.0
T4: Seed priming with 1.0% urea	50.0
T5: Seed priming with 0.5% Ammonium sulphate	50.3
T6: Seed priming with 1.0% Ammonium sulphate	45.3
T7: Seed priming with 0.5% potassium nitrate	46.0
T8: Seed priming with 1.0% potassium nitrate	45.7
T9: Seed priming with GA3 50 ppm	45.0
T10 Seed priming with GA3 100 ppm	45.0
T11: Seed priming with Chlormequate chloride 50 ppm	50.0
T12: Seed priming with Chlormequate chloride 100 ppm	50.3
S.E. (m)+	**1.642**
CD@5%	**4.82**

The number of days required to attain 50% flowering was reduced with priming treatments showed in Table 5. Seed priming with 100ppm GA_3 induced flowering (45 days) early by 5.6 days compared to control (50.6 days). The early flowering may be due to higher endogenous level of GA_3, early completion of vegetative growth and better nourishment of plants. Similar observations in advancement of flowering were reported by [12] and [13].

Overall shows different treatment shows on the morpho-physiological i.e. plant height, number of branches, dry matter content, germination %, 50% flowering results showed in chickpea crop.

FIGURE 1: The morpho-physiological i.e. plant height, number of branches, dry matter content, germination %, 50% flowering results showed in chickpea cropat different treatments



CONCLUSIONS

It is concluded that the different seed priming treatments applied significantly improved the morpho-physiological parameters evaluated in this study. Among the twelve different treatments, the priming of seeds with 05% potassium nitrate for 4 hours registered a significantly higher percentage of emergence and germination in the field. In the priming of seeds with 1% potassium nitrate for 4 hours shows significantly higher plant heights, number of branches and dry matter content were recorded.

Conference disclaimer:

Some part of this manuscript was previously presented in the conference: 3rd International Conference IAAHAS-2023 "Innovative Approaches in Agriculture, Horticulture & Allied Sciences" on March 29-31, 2023 in SGT University , Gurugram, India. Web Link of the proceeding: https://wikifarmer.com/event/iaahas-2023-innovative-approaches-in-agriculture-horticulture-allied-sciences/

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