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INFLUENCE OF NIPPING AND GROWTH RETARDANT ON YIELD AND YIELD PARAMETERS AND ECONOMICS OF PIGEONPEA

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ABSTRACT

The present experiment was carried out to study the effect of nipping and growth retardant on pigeonpea variety PKV-TARA at Agronomy Farm, College of Agriculture, Nagpur during *kharif* season of 2018-2019 in RBD with seven treatments replicated thrice. The soil was medium black in colour, fairly deep, well drained and clayey in texture. The data revealed that the highest test weight (85.75), number of pods plant^{-1}(145.61), number of seeds pod^{-1} (3.90), seed yield (1440 kg ha^{-1}), lowest straw yield (2016 kg ha^{-1}), GMR (101905 Rs ha^{-1}), NMR (72480 Rs ha^{-1}) and B:C ratio (3.5) were obtained when nipping was done at 60 DAS along with application of mepiquat chloride (500 ppm) over rest of the treatments .

(Key words: Pigeonpea, nipping, growth retardant, yield and economics)

INTRODUCTION

Pigeonpea *(Cajanus cajan)* is an important tropical pulse crop and 91 per cent of the world's pigeonpea is produced in India, it ranks second after chickpea in area and production. It is commonly known as red gram or Arhar and grown in *kharif* as well as *semi-rab*i season. In India area under pigeonpea cultivation was 36.3 lakh ha and production was 27.6 lakh tonnes with the productivity of 760.33 kg ha^{-1}. (Anonymous, 2017). In Maharashtra area under pigeonpea was 1.22 m ha and production was 1.05 MT with the productivity of 937 kg ha^{-1} (Anonymous, 2017). Pigeonpea has many uses, the best known being as human food (Whiteman and Norton ,1981). The most usual way of utilizing the crop is as dry split seeds (dal) containing 20-25% of crude protein, but the fresh seeds can also be served as green vegetables. Food values of pigeonpea is protein 22.3%, fat 1.7 %, mineral 3.5 %, fiber 1.5 % and carbohydrates 57.5% in 100 g edible portion.

Nipping by removing the tendrils is an important agronomic practice which helps to reduce the apical dominance. Nipping of tendrils has been found to increase the number of branches, pod set per cent and better source-sink relation, thereby enhancing the yield of plant. (Sharma *et al*., 2003). Mepiquat chloride (MC) (l,l-dimethyl piperidinium chloride) is a gibberellic acid suppressant that is absorbed by the green portions of the plant and serves to reduce cell elongation, thus, offering the potential of decreasing leaf area and restricting additional plant height. (York,1983 and Kerby ,1985). Mepiquat chloride is used as a growth retardant and it reduces plant height, number of nodes, branch length and leaf area (Iqbal *et al*., 2005). The aim of this study was to manage vegetative development of pigeonpea throughout the season by multiple applications of low concentrations of mepiquat chloride.

MATERIALS AND METHODS

A field experiment entitled "Effect of nipping and growth retardant on pigeonpea variety PKV-TARA" was conducted at Agronomy Farm, College of Agriculture, Nagpur during *kharif* season of 2018-2019. The present experiment was laid out in Randomized Block Design with seven treatments *viz.* T_1 Control, T_2 nipping at 60 DAS, T_3-nipping at 90 DAS, T_4-foliar application of mepiquat chloride @ 500 ppm at 60 DAS, T_5-foliar application of mepiquat chloride @ 500 ppm at 90 DAS, T_6-Nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS, T_7-nipping at 90 DAS + foliar application of mepiquat chloride @ 500 ppm at 90 DAS. These were replicated three times. The soil of experimental plot was medium black in color, fairly deep, well drained and clayey in texture. It was poor in available nitrogen and medium in available phosphorus and high in available potassium and slightly alkaline (pH 7.70) in reaction. The crop was sown on 17th July 2018. The crop variety PKV-TARA was used with the spacing of 90 cm × 30 cm. Gross plot size was 5.4 m × 3.6 m and net plot size was 3.6 m × 2.7 m. Observations viz., test

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weight, number of pods plant^{-1}, number of seeds pod^{-1}, seed yield kg ha^{-1} and straw yield kg ha^{-1} were recorded. Gross monetary returns (Rs. ha^{-1}), net monetary returns (Rs. ha^{-1}) and B:C Ratio were also calculated.

RESULTS AND DISCUSSION

Effects of nipping and growth retardant

Test weight (g)

Data presented in table 1 indicate that test weight was influenced significantly by different nipping and growth retardants. The mean test weight was 83.92.Data presented in table 1 revealed that test weight was significantly influenced by different treatments. Amongst the nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6) recorded maximum test weight (85.75) which was at par with treatments nipping at 60 DAS (T_2), foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_4) and nipping at 90 DAS + foliar application of mepiquat chloride @ 500 ppm at 90 DAS (T_7) (85.21) (85.19) and (84.43) respectively. Similar results were found by Chandewar *et al.* (2016).They reported that application of mepiquat chloride at flowering stage @ 150 ppm recorded maximum test weight (94.0 g) which was superior over control. Sharma *et al*. (2003) reported nipping of terminal bud at 50 DAS significantly increased test weight.

Number of pods plant^{-1}

The data pertaining to number of pods plant^{-1} as influenced by different treatments are presented in table 1 indicate that significantly more number of pods plant^{-1} was observed under the nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6) (145.61) and it was significantly superior over control (T_1) but found at par with treatments nipping at 60 DAS (T_2) and foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_4). However, no nipping and application of mepiquat chloride (T_1) recorded significantly the lowest number of pods plant^{-1}. The number of pods plant^{-1} at 120 DAS and harvest showed maximum number of pods in treatments receiving nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6). At harvest the least number of pods plant^{-1} (102.13) were observed in control (T_1). Similar result was found by Baloch and Zubir (2010). They reported that significant improvement in the number of pods plant^{-1} in nipped plants might be due to initiation of higher number of branches plant^{-1} which probably originated more flower buds that resulted in more pods. Similar result was found by Khan *et al*. (2018). They reported that nipping significantly increased the number of pods plant^{-1}. More number of pods plant^{-1} (115.36) was recorded in nipped plants while minimum number of pods plant^{-1} (58.17) was found in non-nipped plants.

Number of seeds pod^{-1}

Data presented in table 1 indicate that number of seeds pod^{-1} was influenced significantly by different nipping and application of mepiquat chloride. The mean number of seeds pod^{-1} were 3.50. The number of seeds pod^{-1} differed significantly among the treatments. The treatments nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6) recorded significantly more number of seeds pod^{-1} (3.90) which was superior over control (T_1) but found at par with treatments nipping at 60 DAS (T_2) and foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_4). The least number of seeds pods^{-1} were obtained in control (3.20). The increase in total number of seeds with growth retardant treatments may be due to better translocation of photosynthates by shortening the plant size. Similar results were found by Kashid (2010). They reported that treatments mepiquat chloride (1000, 1500 and 2000 ppm) recorded significantly higher total number of seeds pod^{-1} than control.

Seed yield (kg ha^{-1})

The data pertaining to seed yield as influenced by different treatments are presented in table 1. Seed yield was significantly influenced due to nipping and application of growth retardant treatments. Nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS recorded maximum seed yield (1440 kg ha^{-1}) which was significantly superior over control but was at par with nipping at 60 DAS (1406 kg ha^{-1}), foliar application of mepiquat chloride @ 500 ppm at 60 DAS (1372 kg ha^{-1}) and nipping at 90 DAS + foliar application of mepiquat chloride @ 500 ppm at 90 DAS. Similar results were reported by Dhital *et al*. (2017). They observed that nipping at 30 DAS followed by secondary nipping at 40 DAS produced significantly higher yield compared to controlled treatment. Application of mepiquat chloride restricting vegetative growth and efficient transport of photosynthates towards reproductive parts resulting in higher seed yield. Similar results were reported by Chandewar *et al*. (2016). They observed that application of mepiquat chloride at flowering stage @150 ppm recorded higher seed yield ha^{-1} (12.1 q ha^{-1}) which was superior over control.

Straw yield (kg ha^{-1})

Mean straw yield (2123 kg ha^{-1}) was significantly influenced due to different nipping and application of growth retardant. Data presented in table 1 revealed that straw yield was significantly influenced due to different nipping and growth retardant. Amongst, the nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6) recorded lowest straw yield (2016 kg ha^{-1}) as compared to control. The highest straw yield was recorded in the no nipping and application of mepiquat chloride (T_1) treatment (2366 kg ha^{-1}). Similar results were found by Chandewar *et al.* (2016). They reported that application of mepiquat chloride @ 150 ppm significantly reduced straw yield.

Gross monetary returns (Rs. ha^{-1})

Data on gross monetary returns are presented in table 1 indicated that the mean gross monetary return was 94608 Rs ha^{-1} and was significantly influenced due to different nipping and application of growth retardant. A

Table 1. Effect of nipping and growth retardant on yield and yield parameters and economics of pigeonpea

Treatments	Test weight (g)	No. of pods plant^{-1}	No. of seeds pod^{-1}	Seed yield (kg ha^{-1})	Straw yield (kg ha^{-1})	GMR (Rs. ha^{-1})	NMR (Rs. ha^{-1})	B:C Ratio
	At harvest	At harvest	At harvest	At harvest	At harvest	At harvest	At harvest	At harvest
T_1-Control	80.58	102.13	3.20	1030	2366	82047	55322	3.0
T_2- Nipping at 60 DAS	85.21	143.06	3.77	1406	2058	100179	71454	3.5
T_3- Nipping at 90 DAS	83.19	129.20	3.40	1267	2160	93229	64504	3.2
T_4- Foliar application of mepiquat chloride @ 500 ppm at 60 DAS	85.19	137.06	3.53	1372	2039	98422	70997	3.5
T_5- Foliar application of mepiquat chloride @ 500 ppm at 90 DAS	83.08	125.72	3.23	1235	2132	91666	64241	3.3
T_6- Nipping at 60 DAS+ Foliar application of mepiquat chloride @ 500 ppm at 60 DAS	85.75	145.61	3.90	1440	2016	101905	72480	3.5
T_7- Nipping at 90 DAS+ Foliar application of mepiquat chloride @ 500 ppm at 90 DAS	84.43	133.06	3.47	1303	2085	94804	65379	3.2
SE (m) ±	0.70	3.77	0.12	55.9	31.0	3342	3342	_
CD at 5 %	2.1	11.31	0.36	167.7	93.0	-	-	_
GM	83.92	130.83	3.50	1293	2123	94608	66339	3.3

maximum gross monetary return 101905 Rs ha^{-1} was recorded by nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6) which was significantly superior over control (T_1). The next best treatment was nipping at 60 DAS (T_2) recorded maximum gross returns and which was at par with foliar application of mepiquat chloride @ 500 ppm at 60 DAS. Similar results were observed by Sharma *et al.* (2003). They reported that the highest gross income (Rs.24180) was realized when nipping was done at 50 DAS.

Net monetary returns (Rs. ha^{-1})

Data on net monetary returns are presented in table 1. Mean net monetary returns was Rs 66339 ha^{-1} which was significantly influenced due to different nipping and application of growth retardant. Maximum net monetary returns (72480 Rs ha^{-1}) was recorded by nipping at 60 DAS along with application of mepiquat chloride (T_6) and was significantly superior over control (T_1). The next best treatment nipping at 60 DAS (T_2) recorded maximum net monetary return which was at par with treatment (T_4) i.e. application of mepiquat chloride at 60 DAS. Roy and Singh (1992) reported higher net returns in chickpea when plants were nipped at 30 or 40 DAS. Similar results were found by Dhaka *et al*. (2018). They reported that nipping at start of branching recorded significantly higher gross return (Rs. 71,984 ha^{-1}), net return (Rs. 37,024 ha^{-1}), benefit: cost ratio (2.05) and value cost ratio (1.05) over no nipping.

Benefit: cost ratio

Data on B: C ratios as influenced due to different nipping and mepiquat chloride application are presented in table 1. The mean benefit: cost ratio was 3.3. Nipping at 60 DAS + foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_6) recorded maximum (3.5) benefit: cost ratio which was at par with treatment nipping at 60 DAS (T_2) and Foliar application of mepiquat chloride @ 500 ppm at 60 DAS (T_4). Least benefit: cost ratio recorded in treatment (T_1) no nipping and application of mepiquat chloride (3.0). Similar results were observed by Sharma *et al.* (2003). They reported that highest benefit: cost ratio (1.98) was realized when nipping was done at 50 DAS. Similar results were found by Pal *et al.* (2017). They reported that highest B:C ratio (1.80:1) was observed in treatment 125 g a.i.ha^{-1} of mepiquat chloride at 35 DAT. It was closely followed by 125 g a.i.ha^{-1} of mepiquat chloride at 50 DAT (1.72:1).

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