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EFFECT OF SULPHUR LEVEL AND DIFFERENT CULTIVARS ON YIELD PARAMETERS OF PIGEONPEA (*Cajanus cajan* L.) UNDER RAINFED CONDITION OF CENTRAL INDIA

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ABSTRACT

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is a premium pulse crop in India. India being the largest producer of tur dal in the world contributes to around 85% of the world's total production that sums up to 2430000 metric tons. A field experiment was carried out at Agriculture Research farm of Mahatma Gandhi Chitrakoot, Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.) during *kharif* seasons of 2014-15 to study the effect sulphur levels and varieties for rainfed pigeonpea. The treatments comprised three varieties viz. V_1 (Pusa 992), V_2 (Pusa 2002) and V_3 (ICPL 88039) and five sulphur levels viz. S_0 – control, S_1 (S @10 kg/ha), S_2 (S @20 kg/ha), S_3 (S @ 30 kg/ha) and S_4 (S @40 kg/ha) in split plot design with three replications. Under sulphur levels, the significantly higher values of pods & seeds per plant of 65.38 & 17.21 g were recorded under S_4 (S @40 kg/ha) followed by 64.87 & 16.52 g under S_3 (S @30 kg/ha) and both the treatments were recorded statistically at par. Seed yield of pigeonpea of 1031.67 kg/ha under variety V_1 (`Pusa 992) was recorded significantly higher than rest levels of varieties. In sulphur levels, the highest seed yield of 496.69 kg/ha was recorded under S_4 (S @40 kg/ha), followed by 971.33 kg/ha under S_3 (S @30 kg/ha). The minimum values of seed yield of 835.89 kg/ha were found in S_0 (control). The highest grain yield was recorded with the highest value of yield contributing traits.

KEYWORDS: Effect, Sulphur Level & Cultivars & Yield Attributes, Pigeonpea

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is a premium pulse crop in India. It is extensively used as dal; its green pods may be used as a vegetable. The green leaves and tops of plants are fed to animals or are utilized as green manure. The husks of pods or seeds with parts of the kernels. Dry stalks are used for basket-making or as fuel or as thatching-material. The dry stems of pigeonpea make an excellent fuel wood. It is also known as Red gram or Arhar or Tur. India being the largest producer of tur dal in the world contributes to around 85% of the world's total production that sums up to 2430000 metric tons. To make the nation self sufficient in pulses, productivity levels of pulses need to be increased sustainability from 598 kg/ha to 1200 kg/ha by 2020 (Ali and Kumar, 2005). Productivity of this crop is still very low due to a number of factors responsible. Mosty imbalanced use of fertilizers, heavy weed infestation, incidence of several diseases & pests and non-use of proper management measures, paucity of quality seed of improved varieties etc. Sulphur deficiency is increased led to intensive cropping, use of complex and high analysis fertilizers. Sulphur had favourable effect on dry matter/plant and yield components due to proper partitioning of photosynthetic from source to sink. Sulphur improves the crop growth, nodulation and yield attributes, by regulating the metabolic and enzymatic processes including photosynthesis, respiration and legume. (Rao *et al.*, 2003). The appropriate combination of varieties with sulphur level studies is limited in this region. For maximizing production of crop & keeping the health of soil in sound condition. Keeping in view these facts the present investigation entitled "Effect of sulphur level and different cultivars on yield parameters of pigeonpea (*Cajanus cajan* L.) under rainfed condition of Central India" was conducted during *kharif* season of 2014-15 at Chitrakoot, Satna.

MATERIALS AND METHODS

A field experiment was carried out during *kharif* season of 2014-15 at Mahatma Gandhi Chitrakoot Gramodaya Vishwavidhyalaya, Chitrakoot, Satna (MP) . The farm is situated under agro-climatic sub zone – Kymore pleateau region & Agro-ecologically semi-arid and sub-tropical climate with 25^0 10'N latitude and 80^0 52' E longitude and about 190-210 meter above mean sea level. The total mean annual rainfall of Chitrakoot is 950 mm in experimental year area. The crop received 597 mm rainfall, during July, 2014 to March, 2015 June and July was the hottest month with maximum temperature of 42.5 ^{0}C. January was the coldest month of the year with minimum temperature of 5.1^{0}C and maximum and minimum humidity was observed in January 99.7 % and minimum humidity 15.1%. The soil of the experimental field was sandy loam with pH 7.46 . Fertility status of soil was categories as low nitrogen (120.16 kg ha^{-1}) and medium phosphorus (11.74 kg ha^{-1}) and medium in

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potassium (215.3 kg ha^{-1}) , organic carbon (0.243%) & EC 0.202 (dsm^{-1} at 25°C). The present field experiment entitled "Impact of sulphur to pigeonpea (*Cajanus cajan* L.) cultivars under rainfed condition" was carried out at Agriculture Research farm of Mahatma Gandhi Chitrakoot, Gramodaya Vishwavidyalaya, Chitrakoot, Satna (M.P.) during *kharif* seasons of 2014-15 to study the effect sulphur levels and varieties for rainfed pigeonpea. The treatments comprised three varieties viz. V_1 (Pusa 992), V_2 (Pusa 2002) and V_3 (ICPL 88039) and five sulphur levels viz. S_0 – control, S_1 (S @10 kg/ha), S_2 (S @20 kg/ha), S_3 (S @ 30 kg/ha) and S_4 (S @40 kg/ha) in split plot design with three replications. Sowing was done on 26/07/2014 in rows with spacing of 50 cm and plant to plant spacing of 15 cm using a seed rate 15 kg ha^{-1} .The seeds were treated with Thiram @ 3 g/kg of seeds and also inoculated by *Rhizobium* 20 g and PSB 40 g/kg of seed before sowing. The recommended dose of fertilizers for pigeonpea was 20:60:20 kg N: P_2O_5: K_2O per ha was applied. Only sulphur was applied as per treatment by sulphur granule (90% S, Salton). Harvesting was done on 24/01/2015 to 10/02/2015 as per the maturity of different varieties with the help of sickle. Profenophas 40 % EC + Cypermethrin 4% EC @ 1.5 lt/ha with 500 liter water was sprayed on green gram as the sucking pest & pod borer incidence were observed. Observations like number of pods $plant^{-1}$, number of seeds pod^{-1}, number of seeds $plant^{-1}$, seed yield (q ha^{-1}) and stover yield (q ha^{-1}) were recorded and stastically analyzed.

RESULTS AND DISCUSSION

Yield Attributes Traits

The observations on number of pods & seeds per plant, seeds per pod & test weight were recorded and the values under various variety and sulphur levels are presented in Table 1. The significantly higher number of pods & seeds per plant under variety were noted under Pusa -992 (65.77 & 17.20 g) followed by the values of 63.85 & 15.44 g, respectively under Pusa 2002. Significantly lowest values of pods & seeds per plant were recorded under variety ICPL-88039 (61.85 & 14.50 g). Under sulphur levels, the significantly higher values of pods & seeds per plant of 65.38 & 17.21 g were recorded under S_4 (S @40 kg/ha) followed by 64.87 & 16.52 g under S_3 (S @30 kg/ha) and both the treatments were recorded statistically at par. The lowest values of pods & seeds per plant of 61.27 & 13.78 g, respectively were recorded under S_0 – control.

Number of seeds per pod of pigeonpea was affected significantly due to level of varieties and sulphur (3.52) under V_1 (`Pusa 992) and followed by 3.03 V_2 (Pusa 2002) and registered lowest of 2.88 under V_3 (ICPL 88039). In case of sulphur doses, the maximum number of seeds per pod were recorded under S_4 (S @40 kg/ha), which was differed significantly with all the other levels. This was followed by the values obtained under S_3 (S @30 kg/ha) and S_2 (S @20 kg/ha) sulphur levels. The lowest values were found under S_0 – control.

The data given in Table 1 clearly indicated that th highest 100-seed weight of 8.82 g was recorded under V_1 (`Pusa 992) in case of levels of variety followed by 8.52 g under V_2 (Pusa 2002). It was recorded lowest under V_3 (ICPL 88039). In case of sulphur levels, it was recorded highest under S_4 (S @40 kg/ha) (8.79 g) being statistically superior to all the other treatment combinations. It was followed by the values of 8.70 g obtained under S_3 (S @30 kg/ha). The significantly lowest values were recorded under S_0 (control). In concerning of varieties, the maximum values were noticed under V_1 (`Pusa 992) (17.2 g) followed by $V_2$ (Pusa 2002) (15.44 g). These values were statistically superior over $V_1$ (`Pusa 992), where the minimum values were noticed 14.5 g. The treatment S_4 (S @40 kg/ha) produced statistically significant highest seed yield per plant of 17.21g bas compared to other sulphur levels. It was followed by S_3 (S @30 kg/ha) and S_2 (S @20 kg/ha). The minimum values were noticed under S_0 – control (13.78 g). Kumar et al. (2014) reported that application of sulphur up to @ 30 kg/ha resulted in significant improvement in growth and yield attributing parameters of pigeonpea. These results are in conformity with the finding of Tripathi *et al.(2011)* and Dialoke *et al.* (2014).

Table 1: Impact of sulphur level and different cultivars on yield attributing characters, yield and harvest index of pigeonpea

Treatment	Yield Attributes				Yield (kg/ha)		
(A) Variety	**Pods / plant**	**Seeds/ pod**	**100 seed weight (g)**	**Seed yield/ plant (g)**	**Seed yield (kg/ha)**	**Straw yield (kg/ha)**	**Stick yield (kg/ha)**
V_1 (`Pusa 992)	65.77	3.52	8.82	17.20	1031.67	1467	4405
V_2 (Pusa 2002)	63.85	3.03	8.52	15.44	904.27	1385	4165
V_3 (ICPL 88039)	61.85	2.88	8.38	14.50	857.27	1410	4235
SEm±	**0.24**	**0.03**	**0.04**	**0.06**	**2.02**	**0.9**	**3.2**
CD (P=0.05)	**0.95**	**0.12**	**0.16**	**0.23**	**7.94**	**3.7**	**12.5**
CV (%)	**1.47**	**3.80**	**1.87**	**1.47**	**0.84**	**0.26**	**0.29**
(B) Sulphur levels							
S_0 (control)	61.27	2.60	8.28	13.78	835.89	1409	4236
S_1 (S @10 kg/ha)	63.51	2.84	8.54	15.39	905.89	1410	4233
S_2 (S @20 kg/ha)	64.11	3.27	8.56	15.68	937.89	1418	4261
S_3 (S @30 kg/ha)	64.87	3.42	8.70	16.52	971.33	1423	4278
S_4 (S @40 kg/ha)	65.38	3.58	8.79	17.21	1004.33	1443	4333
SEm±	**0.17**	**0.04**	**0.03**	**0.08**	**2.64**	**1.1**	**4.0**
CD (P=0.05)	**0.51**	**0.12**	**0.07**	**0.24**	**7.70**	**3.2**	**11.8**
CV (%)	**0.82**	**4.03**	**0.88**	**1.58**	1031.67	1467	4405

Crop Yields

Seed yield of pigeonpea of 1031.67 kg/ha under variety V_1 (`Pusa 992) was recorded significantly higher than rest levels of varieties. It was followed by the seed yield of 904.27 kg/ha under $V_2$ (Pusa 2002) and 857.27 kg/ha variety $V_1$ (`Pusa 992), which gave lowest seed yield. The differences among them were found statistically significant. In sulphur levels, the highest seed yield of 496.69 kg/ha was recorded under S_4 (S @40 kg/ha), followed by 971.33 kg/ha under S_3 (S @30 kg/ha). Sulphur levels S_2 (S @20 kg/ha) and S_1 (S @10 kg/ha) remained on the thirs and fourth positions. The minimum value of seed yield of 835.89 kg/ha was found in S_0 (control). The highest grain yield was recorded with the highest value of yield contributing traits. A similar result was also reported by Gupta *et al.* (2006). Straw yield was recorded significantly highest 1467 kg/ha under variety V_1 (`Pusa 992), followed by 1385 kg/ha under V_2 (Pusa 2002). Minimum straw yield was found under V_3 (ICPL 88039) (1410 kg/ha) and it was differed significantly with other varieties. In case of sulphur levels, treatment S_4 (S @40 kg/ha) gave the highest straw yield of 1443 followed by 1423 kg/ha under S_3 (S @30 kg/ha). The lowest straw yield of 1409 kg/ha was recorded under S_0 (control). Kumar et al. (2014) reported that application of sulphur up to @ 30 kg/ha resulted in significant improvement in grain and straw yield of pigeonpea. These results are in conformity with the finding of Tripathi *et al. (2011).* Kumar and Singh *(2014)* reported that the seed and straw/ stalik yield obtained with Pusa-855 was significantly higher than same noticed with Pusa 992 and UPAS120. Higher Yield could be obtain with the application of phosphorus 90 kg/ha and sulphur 40 kg/ha. Similar were the findings reported by Parameshwarappa (2002) and Bhatt *et al.* (2013).

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