The Pharma Innovation Journal 2022; 11(7): 2448-2450

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(7): 2448-2450

www.thepharmajournal.com
Received: 16-05-2022
Accepted: 27-06-2022

Swarup Ram
Department of Plant Physiology, Agricultural Biochemistry, Medicinal and Aromatic Plants, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Luchika Rana
Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

SP Tiwari
Department of Plant Physiology, Agricultural Biochemistry, Medicinal and Aromatic Plants, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Arti Guhey
Department of Plant Physiology, Agricultural Biochemistry, Medicinal and Aromatic Plants, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Swarup Ram
Department of Plant Physiology, Agricultural Biochemistry, Medicinal and Aromatic Plants, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Impact of temperature and nutrients on yield and yield attributes of cowpea [*Vigna unguiculata* (L.) Walp.]

Swarup Ram, Luchika Rana, SP Tiwari and Arti Guhey

Abstract
The present experiment was conducted in Department of Plant Physiology, Agricultural Biochemistry, Medicinal and Aromatic Plant in five different treatmentsT_1, Control, T_2, RDF NPK ha^{-1}, T_3, 50% dose of NPK ha^{-1}+ Rhizobium @ 5kgha^{-1}, T_4, 50% dose of NPK ha^{-1}+ + Vermicompost @ 2t ha^{-1}, T_5, 50% dose of NPK ha^{-1}+ + Vermicompost @ 2t ha^{-1}+ Rhizobium @ 5kg ha^{-1}. Among all the treatment significantly higher in the pod formation stage (39.90) at the first date of sowing with the treatment S(43). The number of leaves is significantly higher at the first date of sowing in the pod stage (22.90) with the treatment S_5 (25.17). The higher number of branchesS_5 (13.50), S_5 (117.33) at the pod formation stage in the first date of sowing (108.40) shows the significantly highest leaf area, The absolute growth rate is higher in vegetative stage (0.92) and decreases gradually up to the pod stage (0.17) of the plant. The crop growth rate in vegetative stage was higher (0.06) and it gradually decreases to pod formation stage (0.03), chlorophyll content was higher in first date of sowing (51.35), the highest percent of nitrogen (0.04), phosphorus (0.03) and potassium (0.13) uptake were found in first date of sowing and amongst the treatments S_5 shows the highest uptake of all the macronutrients, first pod initiation to harvest (7.36) is higher in third date of sowing and number of pod per plant is higher in first date of sowing (17.52), number of cluster per plant (11.86) and the number of flower per cluster (5.46) are higher in first date of sowing, S_5 shows the highest number of pod per cluster (5.43) and pod length (24.57) respectively. The green pod yield is highest in first date of sowing (114.00) with the treatment S_5 (122.67) followed by S4 (117.67).

Keywords: Temperature, vermicompost, rhizobium, growth, yield

Introduction
Cowpea (*Vigna unguiculata*) is a annual herbaceous legume crop under the genus *Vigna.* It is suitable for sub-Saharan Africa due to its ability to grow in adverse climatic conditions where other legumes cannot flourish well (Kimiti *et al*, 2009) [5]. In cowpea crops its importance as aminerals, protein and energy. It is tolerance for sandy soil and low rainfall. It is gaining more popularity among other vegetable growers due to its short duration, soil rich habit and high attractive nature. Cowpea is mainly intercropped with cereals and hence contributes to soil fertility and sustainability in complex cropping systems in drylands through nitrogen fixation. It is adapted to dry and low fertility conditions where it still produces leaves even though not to its optimal ability under such conditions. (Ayieko and Tschirley, 2006) [6]. In India pulses crop generally produced in poor soil not suited to other crop with the minimum use of resources and have a very low water requirement. In Indian context, it is a minor pulse cultivated mainly in arid and semi-arid area of grown in pockets of Punjab, Haryana, Delhi, and West U.P. along with considerable area in Rajasthan, Karnataka, Kerala, Tamilnadu, Maharashtra and Gujarat (Ministry of agriculture). Under the total pulses production cowpea is an area of 0.5 million hectare grown of all vegetable, and fodder purpose.

The increase in area and production in the state require development of the high yielding variety suitably for the area. In Chhattisgarh region cowpea is cultivated in almost all district but area of cultivation is very less. The Variety Kashi Kanchan is emerging as a popular alternative to local farming on a large scale. It is photo-insensitive in nature as well as early flowering and early picking. Traditionally the crop is raised using primary nutrients supplied directly through fertilizers without the use of micronutrients or bio fertilizers. Mature cowpea seeds contain approximately protein 25%, carbohydrate 63.6%, fat 1.9%, fibber 6.3%, thiamine 0.00074%, riboflavin 0.00042%, and niacin 0.0028% (Davis *et al.* 2000) [2].

Vermi-compost is very beneficial organic compost and substitute for other fertilizers for organic farming. Soil biological component is favourably influenced by the addition of Vermi-compost.

Vermi-compost increase water retention capacity and make the soil loose and porous. Vermi-compost improves the water holding capacity of soil and promotes the establishment of microorganisms. It also helps in maintaining the soil pH in acidic soil and thus helps to promote the activity of microbes in soil. Gaur *et al.*, (1991) [3] reported that organic N is slowly mineralized and about 30% N, 70% P_2O_5 75% K_2O is likely become available to the first crop and the rest of the nutrients to succeeding crops. Vermi-compost is an aerobically degraded organic substance produced with the help of insect's activity. It contains 0.80 to 1.10% N, 0.40 to 0.80% P_2O_5 and 0.80 to 0.98% K_2O, 4.5 to 186.60 ppm Zn, 930.00 ppm Fe and plant growth promoting substances such as NAA, cytokinins, gibberellin, etc. are included. (Giraddi, 2001) [4]. It improves soil physico-chemical properties and increases microbial, crop growth and yield (Vansanthi and Kumaraswamy, 1999) [9].

Material and Method

The research study was conducted at KVK farm, college of agriculture, IGKV, Raipur (C.G) during *rabi* 2018 – 2019. The experiment was laid out in split plot design with five treatments and three replications and the cowpea variety is Kashi Kanchan. Seeds growing in plots with row to row and plant to plant distance is 60 cm and 45 cm apart respectively All the cultural practices were similar foe each block including irrigation, diseases and pest control management. treatments were given at three date of sowings and different nutrients composition $T_{1(S1)}$ Control, $T_{2(S2)}$ Recommended dose of fertilizer NPK $ha^{-1,}$ $T_{3(S3)}$ 50% dose of NPK ha^{-1}+ Rhizobium @ $5kgha^{-1,}$ $T_{4(S4)}$ 50% dose of NPK ha^{-1}+ + Vermicompost @ 2t $ha^{-1,}$ $T_{5(S5)}$ 50% dose of NPK ha^{-1}+ + Vermicompost @ 2t ha^{-1}+ Rhizobium @ 5kg The important parameters encompassed in the research study were - Plant height (cm), no. of leaves, no. of Branches, Leaf area (cm^2 $plant^{-1}$), Crop growth Rate (CGR) (g m^{-2} day^{-1}), Net assimilation Rate (NAR)(g $g^{-1}day^{-1}$), Absolute growth rate(AGR) (g/day). Observations taken on Growth parameters and average yield were observed on five random chosen competitive plants in each treatment of each three replications were averaged.

Results and Discussion

Plant height (cm)

The result related to plant height at different stages have been presented Different dates of sowing and treatments were found significant at both stages. In interaction, among the dates of sowing maximum plant height was noticed in D_1 at both stages whereas minimum plant height was recorded in D_3. Among the treatments S_5 (50% NPK RDF+ rhizobium 5kg/ha+Vermicompost 2t/ha) resulted maximum plant height at different stages followed by S_4(50% NPK RDF +Vermicompost 2t/ha) and minimum plant height was recorded under the treatment S_1(control).Carol Lyngdoh *et al.* (2017) [6] reported similar results, Vermicompost improve the soil physical conditions and promote microbial and soil organic matter, which in turn produces organic acids, which inhibits enzymes, particularly IAA oxidase resulting in enhancing the promotive effect of auxin- IAA which has direct effect on plant growth (Leopold, 1974). Among the dates of sowing maximum number of branches per plant was noticed in D_1 at both stages, whereas minimum plant height was recorded in D3. Among the treatments S5 (50% NPK RDF+ rhizobium 5kg/ha+Vermicompost 2t/ha) resulted maximum number of leaves per plant at different stages followed by S_4(50% NPK RDF +Vermicompost 2t/ha) and minimum plant height was recorded under the treatment S_1(control). The number of branches and leaves due to application of organic manure may be attributed the fact that they possess optimum C: N ratio which on decomposition readily release nitrogen in the easily available form of nutrients ions such as ammonium and nitrate (Anuja and Vijayalakshma, 2014).

The interaction was found non-significant at vegetative stage but found significant at pod formation stage. Among the dates of sowing maximum absolute growth rate was noticed in D_1 at both stages, whereas minimum absolute growth rate was recorded in D_3. Among the treatments S_5 (50% NPK RDF+ rhizobium 5kg/ha+Vermicompost 2t/ha) resulted maximum absolute growth rate at different stages followed by S_4(50% NPK RDF +Vermicompost 2t/ha) and minimum absolute growth rate was recorded under the treatment S_1(control). It is so because AGR is related to the dry weight that a plant accumulates within a time interval (BENINCASA, 2003). The result related to crop growth rate at different stages has been presented in below table. Different dates of sowing and treatments were found significant at both stages. The interaction was found non significant in both stages. Among the dates of sowing maximum crop growth rate was noticed in D_1 at both stages, whereas minimum crop growth rate was recorded in D_3. Among the treatments S_5 (50% NPK RDF+ rhizobium 5kg/ha+Vermicompost 2t/ha) resulted maximum crop growth rate at different stages followed by S_4(50% NPK RDF +Vermicompost 2t/ha) and minimum crop growth rate was recorded under the treatment S_1(control). Gradual increase of CGR at first was due to insufficient vegetative meristems; however, as the plant canopy was completed and due to more efficient application of light and increase of leaf area the rate of CGR increased quickly so that it was maximized and then it decreased due to increase of interplant competition, decrease of light penetration into canopy photosynthetic organs' getting late and also assimilates mobilization into grains (Mani Mojaddam and Abas Noori, 2015) [7].

The result related to net assimilation rate at different stages has been presented in below table and depicted in figure. Different dates of sowing and treatments were found significant at both stages. The interaction was found non-significant in both stages. Among the dates of sowing maximum net assimilation rate was noticed in D_1 at both stages, whereas minimum NAR was recorded in D_3. Among the treatments S_5 (50% NPK RDF+ rhizobium 5kg/ha+Vermicompost 2t/ha) resulted maximum NAR at different stages followed by S_4(50% NPK RDF +Vermicompost 2t/ha) and minimum NAR was recorded under the treatment S_1(control). NAR represents the dry weight accumulated by the plant, considering the plants' leaf area and its previous dry weight. This variable thus represents biomass accumulation caused by increased net photosynthesis, which in turn is the result of greater fixation of light energy per unit of area (barbieri *et al*., 2011; benincasa *et al* 2003)

Table 1: Show the different of plant height number of leaves and branches

Main Plot (Date of Sowing)	Plant height(cm)		Number of Leaves / plant		Number of branches/plant	
	VS	PFS	VS	PFS	VS	PFS
D_1	27.90	39.90	8.50	22.90	3.51	12.06
D_2	27.00	38.83	7.72	22.22	3.32	11.66
D_3	26.44	38.10	7.54	21.80	3.18	11.32
S.Em±	0.08	0.17	0.06	0.06	0.08	0.12
Sub Plot(NPK+Vermicompost + Biofertilizer)						
S_1	25.50	36.51	7.23	17.67	2.83	10.60
S_2	26.23	37.43	7.43	21.33	3.14	11.10
S_3	26.83	38.17	7.83	23.20	3.40	11.43
S_4	27.83	39.60	8.43	24.17	3.53	11.77
S_5	29.17	43.00	8.67	25.17	3.77	13.50
S.Em±	0.08	0.17	7.23	17.67	0.08	0.10

Table 2: Main Plot Date of Sowing of leaf area and AGR CGR and NAR

Main Plot (Date of Sowing)	Leaf Area (cm^2)			AGR (g/day)		CGR (g/m^2/day		NAR (g/g^1/day	
	VS	FS	PFS	VS	PFS	VS	PFS	VS	PFS
D_1	23.30	79.60	108.40	0.92	0.17	0.06	0.03	0.462	0.380
D_2	22.50	77.60	105.60	0.80	0.17	0.05	0.03	0.436	0.352
D_3	21.40	75.00	103.20	0.72	0.13	0.05	0.03	0.40	0.326
S.Em±	0.23	0.07	0.24	0.06	0.00	0.00	0.00	0.00	0.00
S_1	19.67	67.67	95.00	0.52	0.14	0.04	0.03	0.32	-
S_2	21.00	72.33	100.33	0.81	0.16	0.05	0.03	0.37	-
S_3	22.00	76.67	105.67	0.76	0.16	0.06	0.03	0.43	-
S_4	23.83	82.67	110.33	0.90	0.17	0.06	0.03	0.47	-
S_5	25.50	87.67	117.33	1.07	0.18	0.06	0.04	0.55	--
S.Em±	0.30	0.35	0.29	0.03	0.00	0.00	0.00	0.01	--

- growth rate) * CGR (Crop growth rate) * NAR (Net Assimilation rate)
- V.S. (Vegetative Stage) * P.F.S. (Pod Formation Stage) *F.S. (Flowering Stage) * AGR (Absolute

Summary and Conclusion

The present research was carried out with the following objectives.

1. Effect of temperature and humidity on Morpho-physiological parameters of Cowpea.

The plant height was significantly higher in the pod formation stage (39.90) at the first date of sowing with the treatment S_5 (43) followed by S_4 (39.60), S_3 (38.17), S_2 (87.43), S_1 (36.51) respectively. The number of leaves are significantly higher at the first date of sowing in the pod stage (22.90) with the treatment S_5 (25.17) followed by S_4 (24.17), S_3 (23.20), S_2 (21.33) over the Control S_1 (17.67) respectively. The higher number of branches were recorded at the pod formation stage in the 1st date of sowing with the response to treatment S_5 (13.50) followed by S_4 (11.77) and S_3 (11.43) and the least number of branches was observed in treatment S_2 (11.10) followed by Control S_1 (10.60).S_5 (117.33) at the pod formation stage in the first date of sowing (108.40) shows the significantly highest leaf area as compared to the other treatments followed by S_4 (110.33) and the least leaf area was observed in treatment S_2 (100.33) followed by control S_1 (95.00).The absolute growth rate is higher in vegetative stage (0.92) and decreases gradually upto the pod stage (0.17) of the plant.

References

1. Das B, Wagh AP, Dod VN, Nagre PK, Bawkar SO. Effect of integrated nutrient management on cowpea. Asian Journal Horticulture, 6(2):402-405. yield in Rangamati, Bangaadesh. Legume Res. 2011;23(1):9-14.
2. Davis DW, Oelke EA, Oplinger ES, Doll JD, Hanson CV, Patnam DH. Alternative Field crops Manual, 2000.
3. Gaur AC. Bulky organic manures and crop residues. In: Fertilizers, organic matter recyclable wastes and biofertilizer H.L.S Tandon, Fertilizer development and consultation Organisation, New Delhi, 1991.
4. Giraddi RS, Radha D, Kale, Biradar DP. Earthworms and organic matter recycling - an overview from Indian perspective. Karnataka J Agric. Sci. 2001;27(3):(273-284).
5. Kimiti JM, Odee DW, Vanlauwe B. Area under grain legume cultivation and problems faced by smallholder farmers in legume production in the semi-arid, Eastern Kenya, Journal of Sustainable Development in Africa. 2009;11(4):305-315.
6. Lyngdoh C, Vijay Bahadur, David AA, Prasad VM, Tajungsola Jamir. Effect of Organic Manures, Organic Supplements and Biofertilizers on Growth and Yield of Cowpea [*Vigna unguiculata* (L.) Walp]. Int. J Curr. Microbiol. App. Sci. 2017;6(8):1029-1036.
7. Mojaddam M, Noori A. The effect of sowing date and plant density on growth analysis parameters of cowpeas. Indian Journal of Fundamental and Applied Life Sciences. 2015;5(1):224-230.
8. Ayieko M, Tschirley D. Enhancing Access and Utilization of Improved Seed for Food Security in Kenya, Tegemeo Institute of Agricultural Policy and Development, Egerton University, Nakuru, Kenya, 2006.
9. Vasanthi D, Kurriaraswamy K. Efficacy of *vermicompost* to improve soil fertility and rice yield. J lndian Soc. Soil Sci., 47: 268-272.without Rhizobium inoculation on fodder production of cowpea. Indian J Agron. 1999;41(1):91-94.