The Bioscan 11(4): 2517-2519, 2016(Supplement on Agronomy)
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.com

EFFECT OF WEED-CONTROL TREATMENTS ON NUTRIENT UPTAKE BY PIGEONPEA BASED INTERCROPPING AND WEEDS

D. D. DESHMUKH, M. M. DESAI AND H . L. SHIRSATH
Department of Agronomy,
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S.) INDIA.
e-mail:deshmukh.dhananjay72@gmail.com

KEYWORDS
Pigeonpea
Cropping system
Nutrient uptake

Received on :
03.07.2016

Accepted on :
14.10.2016

***Corresponding author**

ABSTRACT
A field experiment was conducted during rainy (*kharif*) season of 2012 and 2013 at research farm, Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra) to study the Nutrients uptake by pigeon pea based intercropping and weeds. The experiment was laid out in split plot design with three replication consisting three cropping system and six weed management practices. Among different cropping system sole pigeonpea recorded maximum N,P,K uptake by grain (28.63,3.21,8.42 kg ha^{-1} respectively) and N,P,K uptake by weed (5.98, 2.37, 6.94 kg ha^{-1} respectively) and in different weed management treatments significantly reduced the nutrient (N, P, K) uptake by weeds at different stages of crop growth. Weed free treatment depleted nitrogen significantly lower than rest of the treatments due to their effective weed control efficiency. Nutrient uptake by weed free treatment are lower than the other treatments.

INTRODUCTION

Pigeonpea crop [*Cajanus cajan* (L.) Millsp.] is one of the important pulse crops in india. Pigeonpea is commonly known as red gram, *tur* or *arhar* and it is the fifth prominent legume crop in the world and second in India after chickpea occupying 14.5 per cent of area and 15.5 per cent of total pulse production (Mishra *et al*., 2011). Pigeonpea being, excellent source of high quality protein and carbohydrate. It occupies an important place in vegetarian population. In India, it occupies an area of 3.89 m ha with a production of 3.02 m t and average productivity of 776 kg ha^{-1}. However, area under this crop in Maharashtra is 11.80 lakh ha with production of 9.66 lakh tonnes (DAC, 2014).

Flower drop is a big problem in pigeonpea and it is the main reason of lower productivity of pigeonpea. It is a deep rooted crop with slow initial growth rate between 60 and 70 days after sowing is well suited for intercropping. Intercropping is an intensive land use system with an objective to utilize the space between the rows of main or base crop and to produce more produce per unit area (Singh *et al*., 1986).The space between the rows could be effectively utilized by growing a short duration crop, which may generate an additional income besides the benefits of suppressing weeds and spreading the risk involved without adversely affecting the yield of pigeonpea (Jat and Ahlawat, 2010).

Sole pigeonpea gets heavily infested with weeds due to wider row and plant to plant spacing, these weeds compete with pigeonpea for growth factors like nutrients, moisture and gave shelter to insect pests. The yield loss in sole pigeonpea due to weeds was 32 to 90 % (Talnikar *et al*., 2008). The critical period of crop weed competition is during the first eight weeks after sowing. Therefore, it is imperative to manage weeds at proper time with suitable methods to obtain maximum grain yield. Weeding by mechanical methods is very common and sometimes these methods becomes very difficult to accomplish because of frequent rains coupled with non-availability of labours in time. Under such conditions, use of herbicides to control the weeds is only the best option to reduce the losses caused by weeds (Manu,2013). In many advanced countries, herbicide usage for control of weeds in crop lands has been proved successful and is now gaining importance in Indian agriculture. With this background the present study was undertaken to give an efficient weed management package to the pigeonpea growing farmers in order to achieve better yields under rain fed conditions.

Research has established that the weed-crop competition for nutrient occur along with other element of competition. Weeds usually uptake mineral nutrient faster than many of our crop part and accumulate them in their tissues in relative larger amount. Species of Amaranthus for example after accumulate over 3 % N in their dry matter Digitaria spp. On the other hand, is a phosphorus accumulator with P_2O_5 content over 3.36%. Chenopodium spp. are likewise potassium lover, with over 4.0% K_2O in dry matter (Modern Weed Management, 2002). The maximum nutrient uptake by pigeonpea (116.99, 11.58 and 41.12 kg N, P_2O_5 and K_2O ha^{-1}, respectively) in hand weeding at 15 and 30 DAS proved most advantages so far as the depletion of nitrogen, phosphorus and potash by weeds was concerned. The hand weeding reduced the depletion of N, P and K by 82, 69 and 79% over weedy check. Keeping all the view in mind an experiment was conducted to study the effect of weed control treatments on nutrient uptake by pigeonpea based intercropping and weeds.

MATERIALS AND METHODS

A field experiment was conducted at Research Farm, Department of Agronomy, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra which is geographically located at north latitude of 19°16′ and East longitudes of 76°47′ and at an altitude of 409 m above mean sea level during *kharif* season of 2012 and 2013.The experimental site was clayey in texture, slightly alkaline in reaction, low in organic carbon , low in available nitrogen , medium in available phosphorus and high in available potassium. Pigeonpea crop cultivar BSMR-736 was used as main crop and Soybean cultivar MAUS-71 and Green gram cultivar BM-2002-01 were used as intercrops for study. The experiment was laid out in split plot design (SPD) with three replication consisting three cropping system *viz.*, sole pigeonpea , pigeonpea + soybean (1:2) and pigeonpea + green gram (1:2) and six levels of weed management practices and RDF (25:50 kg N:P2O5 ha^{-1}). Five plants in each treatment in the net plot area were selected at random and tagged for biometric observations. While taking observations, five plants from sampling rows were pulled off in each treatment plot for recording dry matter production. The intercrops were incorporated within the interspaces after picking of pods of soybean and green gram. Seed and straw sample were analyzed for nutrient content by standard procedure given by Piper (1966). Based on nutrient content of plants and dry matter production, uptake of nitrogen, phosphorus and potassium were worked out. The trend of results was similar during 2012, 2013 and hence, data were subjected to analysis to result and discussion.

RESULTS AND DISCUSSION

Effect on nutrient uptake by grains, total weed and protein percentage

N,P,K uptake by grain and weed significantly maximum with sole pigeonpea followed by pigeonpea + soybean , pigeonpea + green gram intercropping system. This might be due to sole pigeonpea recorded more biological yield over intercropping system and due to higher availability, higher uptake and greater conversion efficiency of applied nutrients by pigeonpea, through secretion of organic acids (Citric, malic, malonic, succinic and piscidic acids) from roots of pigeonpea. Similar results were also recorded by Ishikawa *et al.* (2002) and Kumar (2012). In intercropping system where the base crop is not affected by intercrop and a bonus yield of intercrop is obtained, the total system N, P, uptake by the pigeonpea + soybean and pigeonpea + green gram intercropping system over sole pigeonpea whereas maximum K was recorded in sole cropping than intercrop will always be higher, same outcome was reported by Nagar *et al.* (2015). Higher weed biomass produced in sole pigeonpea due to comparatively better availability of sufficient moisture, nutrients, space and light ultimately resulted into significantly higher nitrogen, phosphorous and potash uptake with these treatments (Goud *et al.*, 2012).

The highest protein content was obtained in sole pigeonpea over other cropping system. This could be due to higher uptake of nitrogen consequent to higher mineralization of soil nitrogen. Due to good growth attributes which encourage the fixation of atmospheric nitrogen and untimely more nitrogen indirectly help in protein content.

Weed management practices

Data on uptake of N,P,K by weeds in kg ha^{-1} at the time of harvesting. Sowing of pigeonpea as influenced by weed management practices has been presented in Table 1. All weed control treatments reduced the N,P,K uptake by weeds as compared to weedy check at the time of harvesting. Weed free condition had recorded the highest content and uptake of nitrogen, phosphorous and potash in pigeonpea closely followed by W_3, W_2 and W_4. After harvesting of pigeonpea, least N,P,K uptake by grains and weeds was recorded in the plot which received weedy check which was significantly lower to rest of the weed control treatments. The lower uptake of nutrients in weedy check could be accounted with the fact that, weeds not only deprive the crop of the valuable nutrients but they also compete with crops for light, moisture and space causing physical impedance both with regard to aerial and subterranean environments (Meena *et al.*, 2010).

Weedy check recorded the highest concentration and uptake of nitrogen, phosphorous and potash by weeds might be due to the vigorous growth of weeds and highest weed biomass production under this treatment. The lowest removal of nutrients by weeds was observed in weed free condition due to their effective weed control efficiency. Uptake of nutrients through weeds was comparatively higher in pendimethalin

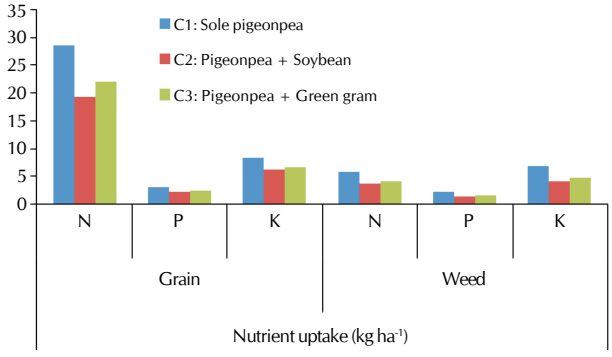

Figure 1: Nutrient uptake by grain and weeds as influenced by pigeonpea based cropping system

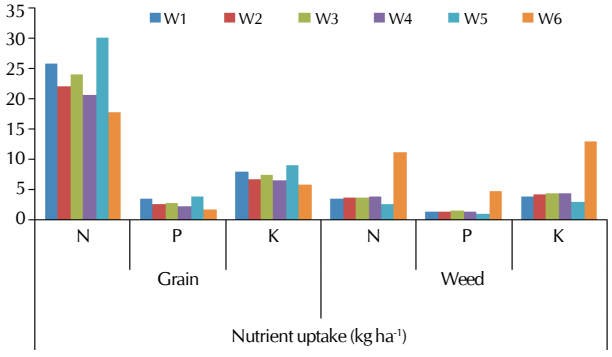

Figure 2: Nutrient uptake by grain and weeds as influenced by weed management practices on pigeonpea based intercropping

Table 1 : Nutrient uptake (kg ha^{-1}) by grain, weed and protein content (%) of pigeonpea as influenced by various treatments of Cropping system and Weed management (pooled data on two years)

Treatments	Nutrient uptake (kg ha^{-1}) Grain			Weed			Protein content (%)
	N	P	K	N	P	K	
Cropping systems							
C_1: Sole pigeonpea	28.63	3.21	8.42	5.98	2.37	6.94	15.50
C_2: Pigeonpea + Soybean	19.38	2.35	6.35	3.76	1.41	4.30	14.56
C_3: Pigeonpea + Green gram	22.12	2.56	6.82	4.25	1.61	4.85	15.06
SE (m) +	0.60	0.12	0.25	0.18	0.09	0.21	0.37
CD at 5%	1.76	0.36	0.73	0.55	0.27	0.63	N.S.
Weed management							
W_1 - Imazethapyr + Imazamox 70% WG (PoE) @ 100 g/ha at 30 DAS	25.80	3.33	7.83	3.34	1.32	3.85	15.68
W_2 - Chlorimuron @ 9 g a.i./ha *fb* Quizalfop ethyl @ 20 g .i./ha at 30 DAS	21.99	2.51	6.70	3.59	1.26	4.07	15.00
W_3 - Pendimethalin (PE) @ 750 g a.i. /ha *fb* one hand weeding at 30 DAS	24.02	2.74	7.35	3.67	1.43	4.24	15.37
W_4 - Imazethapyr (PoE) @ 750 g a.i. /ha at 30 DAS	20.57	2.19	6.52	3.72	1.31	4.29	14.31
W_5 - Weed free	30.11	3.82	8.98	2.60	0.84	2.89	16.68
W_6 - Weedy check	17.81	1.70	5.82	11.09	4.65	12.87	13.37
SE (m) +	1.30	0.20	0.25	0.26	0.15	0.36	0.62
CD at 5%	3.80	0.59	0.73	0.75	0.43	1.05	1.87
Interactions(CXW)							
SE (m) +	2.25	0.35	0.43	0.44	0.25	0.62	1.12
CD at 5%	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
General mean	28.63	2.71	7.20	4.67	1.80	5.37	15.06

with hand weeding, imazethapyr and quizalofop-ethyl mainly because of higher dry weight of weeds in these treatments (Meena *et al*., 2010).

The highest protein yield was recorded under Weed free treatment. Whereas, significantly the lowest protein content (13.81%) was observed under the weedy check. This can be ascribed to better control of weeds by manual weeding and herbicidal method as compared to unweeded condition, which might have increased uptake of nutrients and water, which in turn enhanced assimilation of amino acid leading to increased synthesis of protein. The lowest protein content under weedy check can be ascribed to severe competition by weeds might have resulted in less uptake of nutrients and water, which adversely affected the assimilation of amino acid and ultimately protein synthesis.

REFERENCES

DAC. 2014. *Agricultural Statistics at a Glance*, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India (Website:http://www.dacnet.nic.in/eands).

Goud, V. V., Kale, H. B. and Konde, N. M. 2012. Optimization of crop Geometry and nutriment requirement of medium duration pigeon pea hybrid under rainfed condition. *J. of Food Legumes*. **25 (3):**244–246.

Ishikawa, S., Adu-Gyamfi, J. J., Nakamura, T., Yoshihara, T. and Wagatsuma, T. 2002. Genotypic variability in P solubilizing activity of root exudates by crops grown in low-nutrient environments. In: Food security in nutrient-stressed environments: exploiting plants' genetic capabilities. Adu-Gyamfi JJ (ed).Proceedings of an International Workshop 27–30 September 1999, Patancheru, India..Kluwer Academic Publishers, Dordrecht, The Netherlands. *Dev. Plant Soil Sci.*, vol.**95:**

Jat, R. A. and Ahlawat, I. P. S. 2010. Effect of organic manure and sulphur fertilization in pigeonpea (*Cajanuscajan*) + groundnut intercropping system. *Indian J. Agron*. **55(4):** 276-81.

Kumar, R. 2012. Effect of conservation tillage on growth, yield and quality of pigeonpea based intercropping system under rainfed. *M.Sc.thesis (unpub.) Dr. PDKV,Akola.*

Manu, P. 2013. Chemical weed management in pigeonpea in northern dry zone of Karnataka. *M. Sc. (Agri.) Thesis*, *Univ. Agric. Sci*. Dharwad. p.149.

Meena B., Sagarka, B. K. and Pisal, R.R. 2010. Efficacy of new herbicides in *Kharif* pigeonpea under south Saurashtra condition. *Indian J. weed Science*.**42(1 and 2):** 98-100.

Mishra, U. S., Raizada, S. and Pathak, R. K. 2011. Effect of sulphuron yield attributes, yield and quality of pigeonpea under rainfed condition. *Annals of Plant and Soil Research*. **13(1):** 17-19.

Modern Weed Management. 2002.The nature of Weed- Crop Competition, p.18.

Nagar, R. K, Goud, V. V., Rajesh Kumar. and Ravindra Kumar. 2015. Effect of incorporation of fym, pigeonpea stalk, Phospho compost on growth, yield and nutrient uptake in pigeonpea based inter cropping system *The Bioscan*. **10(3):** 339-343.

Piper, C. S. 1966. Soil and Plant analysis, *Hans. Pub. Bombay. Asian Ed*. pp. 368-374.

Singh, R. C., Rao, P., Dahiya, D. R. and Phogat, S. B. 1986. Studies on the production efficiency and economics of pigeonpea (UPAS-120) under intercropping system. *Legume Research*. **9:** 81-84.

Talnikar, A. S., Kadam, G. L., Karande, D. R. and Jogdand, P. B. 2008. Integrated weed management in pigeonpea [*Cajanus cajan* (*L.*) *Millsp*.]. *Int. J. Agric. Sci*. **4(1):** 363-370.

Vinutha, B. S. And Patil, M. B. 2016. Effect Of Weed Management Practices OnGrowth And Yield Of Pigeonpea [*CAJANUS CAJAN (L.) MILLSP*.]. *The Bioscan*. **11(1):** 619-621.

.....From P. 2516

be distinguished in the text and in the references by letter arranged alphabetically followed by the citation of the years eg. 2004a, 2004b.

Standard abbreviations and units should be used, SI units are recommended. Abbreviations should be defined at first appearance and their use in the title and abstract should be avoided. Generic names of chemical should be used. Genus and species names should be typed in italics.

PROOFS AND REPRINTS

Page proofs will be sent by e-mail to the corresponding author. The corrected proofs should be returned to the Executive Editor within 7 days of receipt. The delay in sending the proofs may shift the paper to the next issue. Correspondence through e-mail will be preferred to avoid delay.

No gratis reprints are supplied. Authors have to purchase 25 or a multiple of it (as ordered) by paying the cost decided on the basis of number of printed pages. The paper will not be printed without proper payment of reprint cost in due time.

MEMBERSHIP OF THE JOURNAL

The individual membership is open only for students and authors. Others can become members of the journal by paying the institutional rates. The membership form should be neatly filled preferably in BLOCK letters. All the authors should become subscribers.

CORRESPONDENCE

Any correspondence regarding the manuscript should be made with Executive Editor to whom the paper has been submitted.

All correspondence regarding subscription, non-receipt of the issues etc. should be made with the managing editors.

REMITTANCES

All payments must be made by DD in the name of "The Bioscan" payable at Ranchi. Outstation cheques will not be accepted.

Address for correspondence
Dr. M. P. Sinha
Executive Editor
D-13, Harmu Housing Colony
Ranchi - 834002, Jharkhand (India)
e-mail: m_psinha@yahoo.com

THE BIOSCAN : SUBSCRIPTION RATES

		India (Rs.)	SAARC Countries	Other Countries
Individuals	One Year	1,000	2,000(I:C)	US $200
	Life Member*	10,000		
Institutions	One Year	3,000	6,000(I:C)	US $400
	Life Member*	30,000		

*Life Member will receive the journal for 15 years while other benefits will continue whole life

THE BIOSCAN : MEMBERSHIP FORM

Please enter my subscription for the above journal for the year ..... / life member.

Name: .....

Address: .....

E-mail: .....

Payment Rs. : ..... by DD / MD in favour of National Environmentalist Association payable at Ranchi, No. ..... Dated ..... is enclosed.

NOTE: FOR MEMBERSHIP THE ABOVE INFORMATION CAN BE SENT ON SEPARATE SHEET