wjpmr, 2022,8(7), 173-176

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

RESIDUAL INFLUENCE OF FYM, FYM+UREA AND UREA ON CROP YIELD AND SOIL FERTILITY STATUS IN ASHWAGANDHA AS SEQUENCE CROP

Dr. Usha Kiran*[1], Preeti Gorla[2] and Charul Anand[3]

[1]Research Officer (Bot.), Central Ayurveda Research Institute (CARI), Jhansi-284003, India.
[2]Research Assistant (Curator), Central Ayurveda Research Institute, Jhansi-284003, India.
[3]Research Assistant (Botany), Central Ayurveda Research Institute, Jhansi-284003, India.

***Corresponding Author: Dr. Usha Kiran**

Research Officer (Bot.), Central Ayurveda Research Institute (CARI), Jhansi-284003, India.

Article Received on 20/05/2022 **Article Revised on 10/06/2022** **Article Accepted on 30/06/2022**

ABSTRACT

The residual effect of fertilizer provides favourable response of crops and helps to supply major nutrients to the sequential crop. The secondary and minor nutrients may also remain available after first crop which offers beneficial effects to the second (sequential) crop. Soluble nitrogen fertilizers offer maximum residual effects in the high yields of second crop. The uses of fertilizers for two crop in sequencing manner one after another reduces excessive utilization of fertilizers thus decreases chances of adverse effects associated with high amount of fertilizers. The approach of sequencing or residual fertilizers also reduces cost of cultivation and maintains soil fertility. Considering these all facts we planned a study to observe effects of FYM, FYM+Urea and Urea on the Uraria picta and then the remaining residual fertilizer on the growth and yield of the Withania somnifera which grew as second crop. Study observed appreciable response of residual fertilizers (FYM, FYM+Urea and Urea) on the growth and yield of sequential crop of Withania somnifera

KEYWORDS: Ayurveda, Residual Fertilizer, Uraria Picta, Withania Somnifera.

INTRODUCTION

Withania somnifera is a small herb grown in colder zones and native habitat is covering perennial. The native habitats include open areas and possess properties similar to that of ginseng. It can be grow in pots two centimeters deep once the air temperature becomes suitable for growth. Exposure to sun, good draining area and slightly alkaline sandy soil is good for the development of this herb. Flowers and fruits appear after or during the first year of seeding and short, gray branched hairs cover the plant. Leaves are opposite the flowering shoots and possess distinct odor. The roots offers characteristics smell and leaves can be used to produce insect repellent.[1-5]

The residual effect of fertilizer gives essential components to the sequential crop and nutrients remaining as residue after major crop offers beneficial effects to the next crop. The minor nutrients available after first crop help to grow second (sequential) crop. Soluble nitrogen as residual fertilizers offers maximum effects in the high yields of second crop.[6-8] The approaches of residual fertilization and sequencing crop offers several advantages as depicted in **Figure 1.**

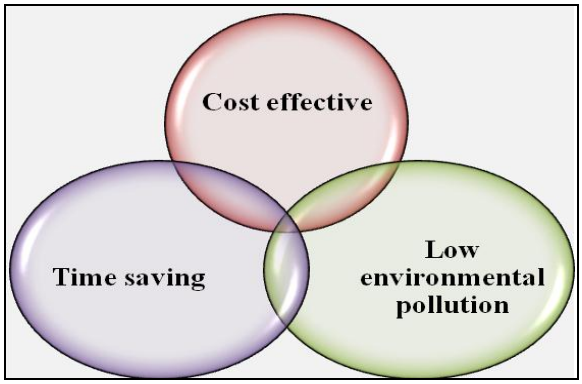

Figure 1: Advantages of utilization of residual fertilizers in sequencing crop.

AIM AND OBJECTIVES

To observe effects of FYM, FYM+Urea and Urea as residual fertilizers on the growth and yield of *Withania somnifera* as second (sequential) crop.

MATERIAL AND METHODS

Uraria picta Desv. ex DC. was used as major crop that after *Withania somnifera* was grown as sequence (second) crop using residual fertilizers of first crop. Fresh mature seeds of *Uraria picta* Desv. ex DC. were collected from healthy plants grown in Garden of

National Vrkshayurveda Research Institute, Jhansi, India.

Fertilizers

Urea was applied @ 100mg N/kg Soil, FYM was given @ 96.59 gm/pot and FYM+Urea used in 50:50 of Nitrogen. Each pot (including control) was given 2.89 gm single super phosphate and 0.77gm muriate of potash.

Procedure

Seeds of first crop were sown at the depth of 0.5cm in raised bed prepared with the red soil of garden in the month of May. Watering was done at an interval of one day, after 60 days, seedlings were uprooted carefully from raised beds and planted in pots filled with red and black soil.

After harvesting of *Uraria picta* Desv. ex DC 45 days old seedlings of *Withania somnifera* Dunal were planted in order to assess the residual value of the applied fertilizer to the preceding crop of *Uraria picta* Desv. ex DC. After six months of transplantation residual crop was harvested and study protocol was set up into four different treatments as follow:

Treatments

1. Control (No N)
2. Urea - N only
3. FYM + Urea (N used in 50:50 ratio from both the sources)
4. FYM only

RESULTS AND DISCUSSION

Effects of residual fertilizers in crop yield

Root yield in *Withania somnifera* Dunal was found to be significantly higher than control as depicted in **Table 1**.

Table 1: Residual effect of FYM, FYM+Urea and Urea alone on the root yield & seeds yield of *Withania somnifera* Dunal.

Treatments	Root yield (gm/pot)	Seeds yield (gm/pot)
Black Soil		
1. Control	2.84	6.42
2. FYM alone	5.27	12.44
3. FYM+Urea	6.87	15.53
4. Urea alone	4.13	10.32
Red Soil		
1. Control	1.42	3.16
2. FYM alone	2.13	8.31
3. FYM+Urea	4.04	9.71
4. Urea alone	2.27	7.66

The treatment of FYM+Urea obtained highest root yield (6.87 gm/pot) in black soil amongst the different treatments followed by FYM and urea alone. Lowest root yield was recorded with the control.

The treatment of FYM+Urea obtained highest root yield (4.04 gm/pot) in red soil amongst the different treatments followed by urea alone and FYM alone. Lowest root yield was recorded with the control.

The productivity and fertilization capacity was observed higher in black soil as compared to the red soil. However maximum yield was observed with FYM+Urea combination in both the soil (**Figure 1**).

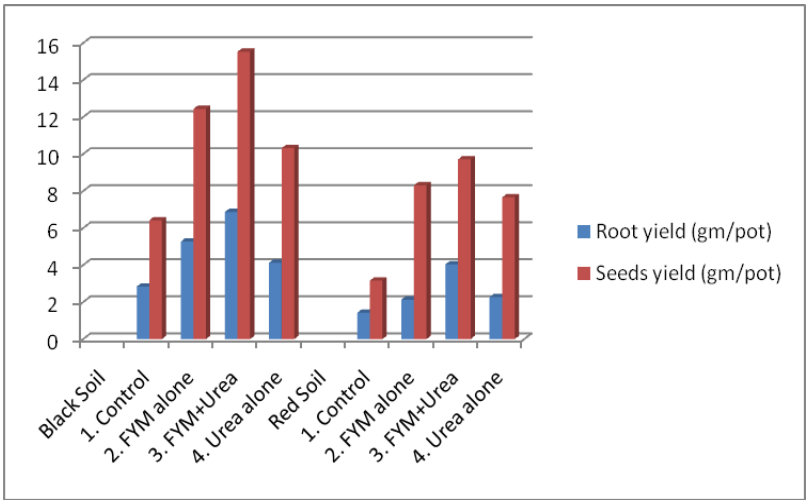

Figure 1: Comparative effects of residual fertilizers in crop yield in both red and black soil.

Effects of residual fertilizers in soil parameters

Higher root yield in case of FYM+Urea could be due to the higher uptake of available-N which has been reflected by the lower available-N in post harvest soil analysis as depicted in **Table 2**.

Table 2: Residual effect of FYM, FYM+Urea and Urea alone on the post harvest soil after the harvesting of *Withania somnifera* Dunal.

Treatments	E.C. (m hos/cm)	pH	Organic Carbon (%)	Available-N (mg/kg)	Available-P (mg/kg)	Available-K (mg/kg)
Black Soil						
1. Control	0.145	8.31	0.94	128.00	8.59	238.05
2. FYM alone	0.143	8.35	1.06	146.96	8.84	250.47
3. FYM+Urea	0.123	8.36	1.00	138.41	9.02	213.81
4. Urea alone	0.146	8.29	1.42	152.95	8.86	244.77
C.D. at 5%	0.004	NS	NS	3.83	NS	10.97
Red Soil						
1. Control	0.082	8.43	0.40	89.51	3.89	164.13
2. FYM alone	0.083	8.68	0.44	98.78	4.74	150.89
3. FYM+Urea	0.083	8.63	0.42	95.50	4.36	173.50
4. Urea alone	0.085	8.69	0.47	109.61	4.31	163.11
CD (p=0.05)	NS	NS	NS	NS	NS	4.94

In red soil higher root yield in urea treated soil could be due to the higher available-N in post harvest soil. In black soil higher seeds yield reflected by lower available-N which could be due to higher N-uptake by the crop.

The pH was found to be slightly higher side among different treatments in both the soils after harvesting the crop.

Organic carbon in both types of soils was found to be higher may be due to the use of FYM and other organic materials.

The available-N was recorded higher side in treated soil than control group. The most suitable soil conditions under organic sources might have helped the mineralization of soil N leading to build up of higher available N.[9,10]

Available-P was recorded slightly higher in treated soils than the control may be due to the greater mobilization of native soil P in the soils.

Available-K was found to be significantly higher with the treated soils may be due to the direct addition of K through FYM and also the added N fertilizers to the available pool of the soil.[11,12]

CONCLUSION

Study concluded that FYM+Urea in 50:50 ratio of N is best for increasing the crop yield of succeeding crop of *Withania somnifera* Dunal which was grown as the residual crop after the *Uraria picta* Desv. ex DC. FYM and urea alone were at par with respect to crop yield, soil fertility status also enhanced with the use of FYM+Urea, FYM and Urea alone. The results obtained in these trials would be helpful to evolve agro technique of rotation crop or sequential crop using residual fertilizers. Study observed appreciable response of residual fertilizers (FYM, FYM+Urea and Urea) on the growth and yield of the sequential crop of *Withania somnifera*.

REFERENCES

1. https://plants.ces.ncsu.edu/plants/withania-somnifera/acessed on, 05/06/22.
2. Ahuja, A., Kaur, D., Sharada, M., Kumar, A., Suri, K. A., and Dutt, P. Glycowithanolides accumulation in in vitro shoot cultures of Indian ginseng (Withania somnifera Dunal). Nat. Prod. Commun, 2009; 4: 479–482.
3. Bandyopadhyay, M., Jha, S., and Tepfer, D. Changes in morphological phenotypes and withanolide composition of Ri-transformed roots of Withania somnifera. Plant Cell Rep., 2007; 26: 599–609.
4. Jha, S., Suri, V.K. & Verma, T.S. Response of rainfed Maize to itegrated nutrient management based on targetted yield concept in a Typic Hapludalf. Journal of the Indian Society of Soil Science, 1997; 45(3): 603-605.
5. Rao, S.S. & Sitaramayya, M. Changes in total and available soil nitrogen status under integrated nutrient management of Rice. Journal of the Indian Society of Soil Science, 1997; 45(3): 445-449.
6. Beaton, J.D. Urea. Its popularity grows as a dry source of nitrogen. Crops Soils, 1978; 30: 11-14.
7. Kumar, B., Gupta, R.K. & Bhandari, A.L. Soil fertility changes after long-term application of organic manures and crop residues under rice-wheat system. Journal of the Indian Society of Soil Science, 2008; 56: 80-85.
8. Sharma, M.P., Bali, S.V. & Gupta, D.K. Crop yield and properties of Inceptisol as influenced by residue management under rice-wheat cropping sequence.

Journal of the Indian Society of Soil Science, 2000; 48: 506-509.
9. Swarup, A. & Yaduvanshi, N. P.S. Effect of integrated nutrient management on soil properties and yield of rice in alkali soils. Journal of the Indian Society of Soil Science, 2000; 48: 279-282.
10. Singh, Y., Singh, B., Ladha, J.K., Khind, C.S., Gupta, R.K., Meelu, O.P. & Pasuquin, E. Long-term effects of organic inputs on yield and soil fertility in the rice-wheat rotation. Soil Science Society of America Journal, 2004; 68: 845-853.
11. Suresh, S., Subramanian, S. & Chitdeshwari, T. Effect of long term application of fertilizers and manures on yield of Sorghum (Sorghum bicolor) – Cumbu (Pennisetum glacum) in rotation on Vertisol under dry farming and soil properties, 1999; 47(2): 272-276.
12. Kumar, M., Yaduvanshi, N.P.S. & Singh, Y.V. Effect of integrated nutrient management on rice yield nutrient uptake and soil fertility status in reclaimed sodic soils. Journal of the Indian Society of Soil Science, 2012; 60(2): 132-137.