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Smart Agronomy of Garlic (*Allium Sativum* L.) Follow on Sodic Land for Higher Bulbs Production and their use in Medicinal Preparation

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ABSTRACT: An experiment was conducted during *rabi* season of 2000-01 to 2002-03 at village *Pal*, Mainpuri under NATP programme for harvesting the potential yield of medicinal plant garlic to making the KVK model, C.S. Azad University of Agriculture and Technology, Kanpur. The site of pilot project situated in sodic land affected area of SWSAZ-IV of Uttar Pradesh. The main objective of study was to harvest the maximum yield of garlic from salt affected soil. The secondary objective was to fulfill the need of consumer and medicinal manufactures. The soil of pilot area was salt affected. Four treatments i.e., conventional system/farmers practice (73.20 kg N +115 kg P_2O_5 + 25 kg $ZnSO_4$ + spaying of Tresol @ 1.25 lit/ha), 120 kg N + 60 kg P_20_5 + 60 kg K_20/ha, 120 kg N + 60 kg P_20_5 + 60 kg K_20 + 25 kg $ZnSO_4$/ha and 120 kg N + 60 kg P_20_5 + 60 kg K_20 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit /ha were tested. Application 0f 120 kg N+60 kg P_20_5+60 kg K_20 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha registered highest yield of garlic bulbs by 107.07 q/ha in comparison to other tested treatments. Combination of ZnSo4 @ 25 kg/ha increased the bulb productivity by 8.00 q/ha. Similarly spraying of Tresol @ 1.25 lit/ha increased the bulbs production by 4.06 q/ha and safe the crop from natural hazards i.e., from fog and frost. Application of 120 kg N + 60 kg P_20_5 + 60 kg K_20 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha displayed the maximum net profit by Rs. 408115/ha, which was superior over other tested treatments. The lowest net income was found under farmers practice. (Rs. 254440/ha). The highest BCR (6.53) computed with 120kg N + 60 kg P_20_5 + 60 kg K_20 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha, while lowest noted under farmers practice (4.45). The 1.60 fold net income increased under applied dose of 120 kg N + 60 kg P_20_5 + 60 kg K_20 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha.

KEYWORDS: Fog, Frost, Fold, Medicinal plant, Natural hazards.

INTRODUCTION

Garlic is a small herb with half tunicated bulb, leaves flat linear grass like, flower white on a globose umbel and its bulbs and leaves is used. Its oil contains Allyl disulphide, Allyl - propyl disuphide and Poly sulphide, Allicin (Anti bacterial) Allicetion I and Allicetion II (Antibiotics). It act as sbermopoitic, Aphrodisiac, Oleative, Digestive Bitter, Pungent, Bone heeling, Tonic, Rejuvenator, Diphoretic, Stomachic, Diuretic, Stimulant - Expectorant Antiseptic and Antibacterial. It use in malerial fever, Flatulance, Epilepsy, Tuberculosis, Ulcer, Ear troubles, Externally, applied as Rube faciant and Antiseptic, Throat disorder, skin disease, Bone ulcer, Chronic cough, Asthma, Bronchitis, Gangeme of lungs, Lobar pneumonia etc.

With the consideration of above points, it has been understand that smart agronomy is essential for enhancement of bulbs yield up to the extent of potential level. For this, detail crops and soil survey was done in district Mainpuri by scientific team of National Agricultural Technology Project , Zonal Agriculture Research Station, Mainpuri, C.S. Azad University of Agriculture and Technology Kanpur. It has been observed that Mainpuri has maximum area under salt affected, where the farming communities cultivate the garlic crop with imperfect agronomical practices, result in, low bulb yield of garlic reaped by farmers. Through the sale price of garlic bulbs in market is higher, therefore sufficient net income earn by formers and feel happiness. For potential yield production, smart agronomy of garlic cultivation was developed in salt affected soil for fulfilling the domestic, consumers and medicinal needs and earns nice net income in comparison to the yield harvested by farmers.

Therefore, the development of smart agronomy for maximum production of bulbs of garlic is the subject matter of this manuscript.

MATERIALS AND METHODS

The present study was under taken during autumn season of 2000-01 to 2002-03 at village *Pal,* Mainpuri under NATP programme for harvesting the potential yield of garlic and making the KVK model. The site of pilot project situated in sodic land affected area of South-Western Semi Arid zone-IV of Uttar Pradesh in catchments area of *Isan* river. The main objective of study was to harvest the maximum yield of garlic from salt affected soil. The secondary objective was to fulfill the need of consumers and medicinal manufactures. The soil of pilot area was clay loam having pH 8.5, organic carbon 0.21% total nitrogen 0.02% , available P_20_5 8.70 kg/ha and available K_20 163 kg/ha, therefore, the fertility status of experimental soil was low. The pH was determined by Electrometric glass electrode methods (Piper, 1950), while organic carbon was determined by Colorimetric method (Datta *et.al.*, 1962). Total nitrogen was analyzed by Kjeldahl's method as discussed by Piper (1950). The available P_20_5 and K_20 were determined by Olsen's method (Olsen *et. al.*, 1954) and Flame photometric methods (Singh, 1971), respectively. The farming situation of area was irrigated. The main problems of the area was imperfect agronomy used by farmers, which provided low yield of garlic. Four treatments i.e. conventional system/farmers practice with the use of 73.20 kg N + 115kg P_2O_5 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha, 120 kg N + 60 kg P_2O_5 + 60 kg K_20/ha, 120 kg N + 60 kg P_20_5 + 60 kg K_20 + 25 kg $ZnSo_4$/ha and 120 kg N + 60 kg P_2O_5 + 60 kg K_20 + 25 kg, $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha were tasted. The garlic was planted in second fortnight of October in three experimental years and harvested after complete maturity of bulbs. The *Yamuna white* (G-1) variety was planted in the experiment. The crop was irrigated as and when required. All smart agronomical practices were followed in raising of nice garlic crop as suggested by Singh *et.al. (*2008) and Singh *et.al*.(2021)

RESULTS AND DISCUSSION

The data were recorded and reported in Table-1 and discussed here under appointed heads:

(A) Productivity of garlic bulbs –

There years data of garlic productivity were recorded and averaged. Application of 120 kg N + 60 kg P_2O_5 + 60 kg K_20 + 25 kg, $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha registered highest yield of garlic bulbs by 107.07 q/ha compared with other tested treatments. The balance combination of N + P + K + $ZnSo_4$ and spraying of Tresal was responsible for the higher production of garlic bulbs. The lowest yield of bulbs by 72.92 q/ha was recorded under farmers practice. (application of 73.20 kg N + 115 kg P_2O_5 + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha) or conventional system. The reduction of bulbs yield under this treatment was due to unbalance application of nutrients i.e., low dose of nitrogen, higher dose of phosphate and non application of potassium, responsible for lower yield. Application of Znso4 @ 25kg/ha increased the bulb

productivity by 8.00 q/ha or 8.42%. Similarly, spraying of Tresal @ 1.25 lit/ha increased the bulbs productivity by 4.06 q/ha or 3.94%. The other two treatments of nutrients application gave bulbs yield between these two limit but these treatments increased the garlic productivity in comparison to farmers practice. These results are commensurable to the findings of Singh *et.al.* (2008)

(B) Economic study:-

The highest gross return Rs. 481815/ha, net return Rs. 408115/ha and BCR 6.53 were computed under 120 kg N + 60 kg P_2O_5 + 60 kg K_20 + 25 kg, $ZnSo_4$ + spraying of Tresol @ 1.25 lit/ha followed by 120 kg N + 60 kg P_2O_5 + 60 kg K_20 + 25 kg, $ZnSo_4$ with gross return Rs. 463545/ha, net return Rs. 389845/ha and BCR (6.28). Application of 120 kg N + 60 kg P_2O_5 + 60 kg K_20/ha gave gross return Rs. 427545/ha, net return Rs. 353845/ha and BCR (5.80). The farmers practice/ conventional system gave gross return Rs. 328140/ha, net return Rs. 254440/ha and BCR 4.45, which were lowest in comparison to all other tested treatments. The low and high yield of garlic bulbs was responsible for lower and higher net income and BCR. These findings are in agreement with those reported by Singh *et.al.* (2021)

The T_2, T_3 & T_4 treatments increased the net income in fold by 1.30, 1.53 and 1.60, respectively.

CONCLUSION

Application of 120 kg N + 60kg P_2O_5 + 60 kg K_20 + 25 kg $ZnSo_4$ + spraying with Tresol @ 1.25 lit/ha gave higher yield in salt affected soil. This applied dose increase the net income of farmers by 1.60 fold.

Application of research:- Therefore, farm families residing in the area of salt effected soil, may be advocated for application of 120 kg N + 60 kg P_2O_5 + 60 kg K_20 + 25 kg, $ZnSo_4$ +spraying with Tresol @ 1.25 lit/ha to achieve higher yield of garlic and for harvesting the fruits of nearly generated technology.

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Table 1. Bulb yield of garlic and economics of production of medicinal plant of garlic (pooled data of three years).

S. No.	Treatment	Bulb yield q/ha				Cost of Cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs./ha)	BCR	Net income increase in fold
		2000-01	2001-02	2002-03	Average					
1.	Conventional system/farmers practice 73.20 kg N + 115 kg $P_2 0_5$ + 25 kg $ZnSo_4$ + spraying of Tresol @ 1.250 lit/ha(T_1)	73.00	66.26	79.50	72.92	73700	328140	254440	4.45	-
2.	120 kg N + 60 kg $P_2 0_5$ + 60 kg $K_2 0$/ha (T_2)	98.50	91.30	95.25	95.01	73700	427545	353845	5.80	1.39
3.	120 kg N + 60 kg P_2O_5 + 60 kg $K_2 0$ + 25 kg, $ZnSo_4$/ha (T_3)	105.25	100.20	103.60	103.01	73700	463545	389845	6.28	1.53
4.	120 kg N + 60 kg P_2O_5 + 60 kg $K_2 0$ + 25 kg, $ZnSo_4$ + spraying of Tresol @ 1.250 lit/ha (T_4)	108.50	105.82	106.90	107.07	73700	481815	408115	6.53	1.60

Note – Market sale rate- Rs. 4500/quintal of garlic