Vol. 19 July - December, 2024 No. 2

ABSTRACTED IN CABI, U.K., SHIMAGO, CROSS REF, INDIAN CITATION INDEX AND GOOGLE SCHOLAR, PUBLONS, CITEFACTOR

Journal of Natural Resource And Development

(Peer Reviewed, Refereed Research Journal of Agriculture and Science)

Abbreviated title of Journal : *Jour. Nat. Res. Dev.*

NAAS RATING : 4.23

online @ www.sbsrd.org

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT
10/96, Gola Bazar, New Jhusi, Prayagraj - 211 019 (U.P.), INDIA

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Vol. 19 July - December, 2024 No. 2

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT

CONTENTS

Vol. 19 July - December, 2024 No. 2

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT

CONTENTS

Vol. 19 July - December, 2024 No. 2

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT

CONTENTS

Vol. 19 July - December, 2024 No. 2

SOCIETY OF BIOLOGICAL SCIENCES AND RURAL DEVELOPMENT

CONTENTS

Journal of Natural Resource and Development 19 (2) 1-4, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

CONSTRAINTS FACED BY THE RESPONDENTS IN ADOPTING PMAY URBAN HOUSING PROGRAM

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Received : 30.04.2024 Accepted : 21.06.2024

ABSTRACT

The study explores the constraints faced by beneficiaries in adopting the Pradhan MantriAwasYojana - Urban (PMAY-U) housing program in Sikrara block, Jaunpur district, Uttar Pradesh, during 2022-23. Utilizing a purposive sampling method, 120 respondents were selected from five villages to assess their experiences with the scheme. Key constraints identified include lack of land ownership, high material costs, insufficient funding, migration issues andpoverty, which significantly hinder the adoption of the program. The study also highlights suggestions from beneficiaries, such as reducing delays in subsidy disbursement, increasing awareness of affordable housing projects and providing better support for documentation processes. The research concludes that while PMAY-U aims to improve housing conditions for urban poor populations, addressing these barriers is essential for its successful implementation.

Keywords : *Constraints, urban poor, financial assistance, affordable housing, socio-economic upliftment, subsidy disbursement, documentation process.*

INTRODUCTION

The Pradhan MantriAwasYojana - Gramin (PMAY-G), launched in 2016 by the Government of India, is a significant component of the country's broader "Housing for All" initiative. This scheme is aimed at ensuring that every rural family has access to affordable housing by 2022. The program specifically targets economically weaker sections (EWS) and low-income groups (LIG), providing financial assistance for constructing durable "pucca" houses, which are designed to withstand harsh weather conditions and offer better living standards.

Each eligible beneficiary under PMAY-G receives financial support up to Rs. 1.2 lakh to build their own house. This assistance is disbursed in three installments directly to the beneficiary's bank account based on construction milestones. In addition to financial help, the government provides technical guidance to ensure that the houses are built to appropriate safety and sustainability standards. Beneficiaries are trained in using eco-friendly construction materials and techniques, encouraging sustainable development in rural areas.

In Jaunpur district, Uttar Pradesh, the scheme has been actively implemented to meet the housing needs of the rural population. The district administration has been tasked with identifying eligible beneficiaries, including homeless

individuals and those living in inadequate housing and ensuring that they receive necessary support. The financial assistance from PMAY-G allows these individuals to construct their homes while the technical assistance provided equips them with essential construction skills.

The scheme aims to not only improve housing conditions but also uplift the socio-economic status of rural communities by providing them with stable, secure homes. The program ensures that housing construction progresses efficiently, with regular monitoring and timely fund disbursements. The inclusion of training and capacity-building activities for beneficiaries has also played a vital role in the program's success.

MATERIALS AND METHODS

The research methodology for assessing the constraints faced by respondents in adopting the Pradhan Mantri AwasYojana - Urban (PMAY-U) program in Sikrara block, Jaunpur district, Uttar Pradesh, during 2022-23, utilized a purposive sampling approach. Sikrara block was selected due to its varied socio-economic conditions and the ongoing implementation of PMAY-U. Jaunpur district, with its six tehsils and 21 development blocks, was chosen for its relevance in assessing the program's impact on rural housing. Five villages from the block were chosen based on the number of beneficiaries, accessibility and active implementation of PMAY-U, ensuring a diverse range of respondents. A total of 120 respondents were selected from the list of beneficiaries provided by the program officials, focusing on those who had received financial aid for constructing houses under the PMAY-U scheme.

Data collection was carried out using structured interviews with a pre-tested questionnaire that covered various aspects, such as demographics, awareness, challenges in receiving funds andconstruction-related issues. Primary data was gathered through face-to-face interviews, allowing respondents to voice their challenges and experiences with the program. The data was then analyzed using **descriptive statistics,** focusing on identifying major constraints such as delays in fund disbursement, lack of technical support and difficulties in acquiring construction materials.

RESULTS AND DISCUSSION

Constraints faced by the respondents in adopting PMAY Urban Housing program.

Table 1 shows that the respondents expressed that major constraint was lack of land of tenure ship 93.33 Per cent, followed by sky high cost of material 90 Per cent. The Lack of Funding Facility was another constraint reported by the Urban 86.66 Per cent, Migration 81.66 Per cent and Severe poverty crisis 77.5 per cent and Insufficient subsidy 70.83 Per cent, Lack of employment 66.66 Per cent, Lack of Land Availability 65.83 Per cent, Inadequate Information 61.66 Per cent and Natural Calamity 58.33 Per cent were issues faced by the urban deprived people. It is noted that the constraints were more than half and crucial to solving for Urban People life betterment.

Table: 1 constraints faced by the respondents in adopting PMAY Urban Housing program.

S. N.	Constraints	Respondents	Percent	Rank
1.	lack of land of tenure ship	112	93.33	I
2.	sky high cost of material	109	90	II
3.	Lack of Funding Facility	104	86.66	III
4.	Migration	98	81.66	IV
5.	Severe poverty crisis	93	77.5	V
6.	Insufficient subsidy	85	70.83	VI
7.	Lack of employment	80	66.66	VII
8.	Lack of Land Availability	79	65.83	VIII
9.	Inadequate Information	74	61.66	IX
10.	Natural Calamity	70	58.33	X

It is imperative to find the reasons which are lacking in the programme of PMAY Housing Programme. The following major reasons are precursor for backwarding the programme in the study area. This finding finds support with the work of Nilsen (2003).

Suggestions from the respondents to overcome these problems.

This chapter concludes that the Pradhan MantriAwasYojana [PMAY] Housing for All [Urban] Programme is implemented in a systematic manner to improve the urban people life style by fulfilling the basic amenties and facilitating modern technologies in the housing services. It is understood that the study covered more elobratly in the aspects of personal characteristics of housing beneficiaries such as age, education and occupation, efffectiveness of PMAY Urban Housing Programmes such as financial and non-financials. Infrastructure and personal growth services. Influencing factors of Pradhan MantriAwasYojana [PMAY] Housing for All [Urban] Programme's knowledge and time duration. This leads to understand more about the beneficiaries views on the programme through Case Studies in the subsequent chapter.

Table 2 shows the data based ranking of the suggestions for effective implementation of PMAY Urban Housing. As evident, Bank/HFCs should reduce the time taken for facilitating the subsidy 95 Per cent, List of government projects available under affordable housing to be available on public domain 93.33 Per cent and anyone of the family members should be allowed to apply under all the categories 83.33 Per cent are the three most important suggestions for improvement of PMAY Urban Housing. Other suggestions include All State and union Government should have a uniform policy for building approval plan 79.16 Per cent, Promotional activities about PMAY Urban Housing should be improved by creating more awareness 76.66 Per cent, Providing dedicated bank/HFCs official for assisting and guiding the customers in documentation process for PMAY Urban Housing 74.16 Per cent and regular meetings between banks /HFCs and SLNA should be held for better coordination, implementation of the scheme 69.16 Per cent. It is therefore inferred that there should be flexibility in the norms of the scheme.

Table - 2 : Suggestions for effective implementation of PMAY Urban Housing.

Sr. No	Recommendation/Suggestions	respondent	percent	Rank
1.	Bank/HFCs should reduce the time taken for facilitating the subsidy.	115	95	**I**
2.	Promotional activities about PMAY Urban Housing should be improved by creating more awareness by government , banks and HFCs.	92	76.66	**II**
3.	Providing dedicated bank/HFCs official for assisting and guiding the customers in documentation process for PMAY Urban Housing.	89	74.16	**III**
4.	List of government projects available under affordable housing to be available on public domain.	112	93.33	**VI**
5.	Regular meetings between banks /HFCs and SLNA should be held for better coordination, implementation of the scheme.	83	69.16	**V**
6.	All State and union Government should have a uniform policy for building approval plan.	95	79.16	**VI**
7.	Anyone of the family members should be allowed to apply under all the categories.	100	83.33	**VII**

The beneficiaries were asked to give their suggestions for effective implementation of. The details of their responses are analyzed and presented in the Table 2.

The beneficiaries faced problem in getting housing subsidy for flats /houses as maps of the applied project under affordable housing were not approved by the state government authorities. Due to lack of education the beneficiaries did not have literacy skills thus hindering the documentation process. This finding finds support with the work of Jing (2019), Noah (2019).

CONCLUSION

The study on the Pradhan Mantri Awas Yojana - Urban (PMAY-U) program highlights significant constraints faced by the respondents in adopting this housing initiative in the Sikrara block of Jaunpur district, Uttar Pradesh.The analysis revealed that key barriers include a lack of land ownership, high construction material costs, inadequate funding, migration challenges andsevere poverty, which collectively impede the program's effectiveness in providing adequate housing. These challenges are exacerbated by insufficient subsidies, lack of employment opportunities, inadequate information and natural calamities, making it difficult for urban poor families to access and benefit from the program. These findings underscore the need for a comprehensive approach that addresses both financial and structural challenges to ensure the program's success.

To improve the implementation of PMAY-U, several recommendations were made by the respondents, including reducing delays in subsidy facilitation, increasing public awareness of government housing projects and providing dedicated support for beneficiaries during the documentation process. The study emphasizes that more focused promotional activities and regular coordination between government authorities, financial institutions and the beneficiaries are necessary to enhance the program's reach and impact. By addressing these constraints and incorporating the suggested improvements, the PMAY-U program can better fulfill its mandate of providing affordable housing and contribute to the socio-economic upliftment of urban poor populations.

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Journal of Natural Resource and Development 19 (2) 5-11, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

IMPACT OF DOUBLING FARMERS INCOME (DFI) PROGRAMME ON TRIBAL WOMEN'S ECONOMY IN ARUNACHAL PRADESH

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ABSTRACT

The study was conducted to assess the Impact of, Doubling Farmers Income programme on the well being of rural women's applying different farm income activities and also to explore relationship between the selected characteristics of the women and their empowerment. A rural womens groups having 30 nos. of respondents were selected for the purpose among a pool of 80 farm families in the Changpa village of Dirang circle in West Kameng District of Arunachal Pradesh. The different technological interventions were made to initiate the farming in a fellow land patch which was developed by the help of KVK and WWF by providing the solar fencing and plaguing provision jointly. Earlier this patch was lying unused and just cattle's were moving there and used it as meadow. In the study area different income generating activities were initiated trough the interventions made by the K.V.K with application of scientific practices. For the study activities were ranked on the basis of increase in income percentage and their preference by the women group. According to rank order vegetable production including ginger was found to rank first followed by turmeric and the fruit, nursery & rootstock production of temperate fruit crops as 2nd, the production of different crops like paddy and maize, as 3rd while fishery & poultry as 4rd, while mushroom production as 5th and Vermi-composting as 6th respectively. Majority of the activities were agriculture related while 3 activities *i.e.* 2 handicraft activity *i.e.* Singka making and weaving of sweaters and one activity under non handicrafts segment *i.e.* Local paper making from wood chips were non agricultural activities having rank I,II and III respectively.

Keywords : *Empowerment, handicrafts, farm activities, temperate fruit crops & farmwomen etc.*

INTRODUCTION

The DFI program aims to improve the quality of life for farmers by increasing their income and uplifting the agricultural sector program, includes strategies to increase productivity, diversify income and improve resource use efficiency. The main goal of Doubling Farmers Income (DFI) progarmme was to double the farmers' income by the year 2022. It is possible by formulating suitable action plan and efficient use of location specific technologies in the farmers' fields. A multi range of approaches and strategies were adopted starting from transformation of production-driven as well as market-driven factors

and providing an enabling environment, which support the farming community in all their endeavours to achieve the said target of this important flagship programme.

It is not possible to achieve any target without involvement of women's "The agent of Change" in any flagship programme launched by the government/ any socioeconomic developmental activities especially in Agriculture. Women's have the major share in agricultural workforce, playing an important role in the agriculture sector and development of rural economy (Maurya & Mishra 2022) It is the single largest production endeavor in India, contributing substantially to the GDP of nation and employs 80% of all economically active women; comprising 33% of the agricultural labour force and 48% of self-employed farmers. At present they are playing a significant and crucial role in agricultural development with active participation in all range of agricultural/allied activities including pre-harvesting and post- harvesting/processing. The Increasing percentage of female operational holders during different Agriculture Censuses indicates participation of more and more women in operation and management of agricultural holdings in the country. As farmers, labourers, and entrepreneurs, women play an important role in the development of agriculture and rural economies as well. With increasing involvement in land and water management and as collectors of water and fodder, women provide critical support to the farms and livestock in areas where soil is unproductive, rains are erratic/insufficient, and the men have migrated in search of work, leaving the women behind to earn additional incomes through agriculture and allied activities. Being unpaid in nature, these efforts of women are dampened as they are not recognized as primary producers. The women continue to face constraints in accessing land, credit, technology, agricultural inputs, services, and market opportunities. In spite of these above said hurdles the objective of the any DFI activity cannot be fulfilled without the participation of women's especially in North Eastern states of India. In NE region the participation of women's in agriculture is likely more about 70% in comparison to other Indian states and in Arunachal Pradesh women's play a major role in agriculture, including looking after livestock and collecting fuel wood and vegetables. They work as cultivators, entrepreneurs, and laborers in a variety of activities, from planting and harvesting to post-harvest operations. Women are also involved in allied fields such as livestock production, horticulture, fishing, and agro/social forestry. Without the participation of women in the development process, society as a whole cannot be said to develop sufficiently (Agarwal, D., 2000). The said facts are adequate to say that rural women are still stands near negligence and have little opportunity to make decision, to engage in IGAs, to participate in social and political activities. But national development is not possible without integrating them into the mainstream of the development process. In view of the above facts the present study was undertaken to assess the nature and extent of the empowerment of rural women through involvement in an important flagship (Doubling Farmers Income) Programme launched by Gov. of India.

MATERIALS AND METHODS

A cluster of 30 farm women's were selected from Changpa villages under Dirang circle of West Kameng district Arunachal Pradesh for this study during 2017-2022. All the household women were listed with the help of Gaon Bura of concerned village. There were a total of 80 such farm household women which constituted the sampling population for this study. Mixed methods research

approach (MMRA) was followed for collecting qualitative and quantitative data using focused group discussions, key-informant interviews, and in depth household interviews (Sendhil.,2017). Assessment of demographic profile, primary data collection on gendered contribution to family income, gendered scope of doubling family income and analysis of cropping pattern and other allied activities were carried out. Mapping the resource-base of the eco-system was done using PRA tools and interaction with local leaders/Gaon Buras and key informants. Analysis of agricultural and allied activities, income pattern and expenditure (cost of cultivation), and activity wise income generation by men and women were carried out through analysis of secondary/ census data/ micro level studies. Identification of gaps and prioritization of needs were done through stakeholder meetings, group interactions & field work and interview schedule based on formal and informal surveys. Independent variables of the study were measured following standard techniques such as age was measured in years, education was measured in schooling years, family size is actual number of the family members, earning experience was measured in years, household annual income was measured in Rupees. Micro level studies were also conducted for identification of gaps need prioritization, and to develop an action plan accordingly. The need based modules has been implemented double the income of farm families through training, demonstrations, capacity building programmes, input support and advisory services. Modules were allotted to different farm woman's as per their land share in the developed patch and their farming interests. Concurrent monitoring and assessment for all the interventions made were done to acknowledge the impact of doubling farmer's income programme on the overall well being of respondents.

RESULTS AND DISCUSSION

Assessment of Independent variables:

The data recorded in table 1 showing the education standard and their percentage. The highest proportion 60 percent of the respondents in the study area were in the age group of 30-45 year followed by 26% between 25-30 years and the lowest share recorded was 14% between age group of 45-50 years. In term of knowledge and education level the group G1 have high level of knowledge with Intermediate to Graduation standard education while G2 a major share with medium level of knowledge and 6-10th standard of education followed by G3 having lowest knowledge level with education standard ranging from class 3-5. Training exposure of all the respondents were recorded in the range of 11-76%.

The Group G1 have highest 76% share of

Table - 1 : Respondents and their educational background along with family size

S. No.	Level of Knowledge	No. of Respondents	Share (%)	Age (Year)	Education standard	Training Exposure (%)	Family Size (%)
1	High (G1)	8	26%	25-30	Class 12 to Graduate	76%	Small (47%)
2	Medium (G2)	18	60%	30-45	Class 6-10	13%	Medium (51%)
3	Low (G3)	4	14%	45-50	Class 3 to 5	11%	Joint (2%)

training exposure with varying duration followed by G2 with 13% share and 11% share was recorded in the case of G3.While in term of family size 51% have medium size of family followed by 47% with small family and joint family size was recorded only in case of 2% respondents. Majority of the women had lower income status and some of them have credit loan from different SHGs at higher rate of interest.

Existing income generation activities and preference status:

Agricultural Activities

Among Existing agricultural activities vegetable production including ginger and turmeric was found to rank first followed by the fruit, nursery & rootstock production of temperate fruit crops as 2nd while the production of different crops like paddy, maize and soybean ranked 3rd whereas fishery & poultry as 4th, and mushroom production as 5th and Vermi-composting as 6th respectively. The detail as per their rank is illustrated in **Table No.2**

Non agricultural activities

Table - 2 : Type of mix agricultural and allied activities and their rank on the basis of farming preference

S. No.	Type of mix agricultural activities	Activity rank
1	Vegetable, Ginger and Turmeric production	I
2	Fruit, nursery & rootstock production of temperate fruit crops	II
3	Production of different crops like paddy, maize, and Soybean	III
4	Fishery, Poultry and Duckery	IV
5	Mushroom production	V
6	Vermi-compost Production	VI

Majority of the activities were agriculture related while 3 activities, two handicraft activity *i.e.* Singka making and weaving of sweaters and one activity under non handicrafts segment *i.e.* Local paper making from wood chips were non agricultural activities. The 65 % of respondents were found to prefer the singka making having rank I, followed by II in sweater weaving with preferred share percentage of 23% whereas Local paper making from wood chips have III rank with 2% share in term of preference by the respondents. The detail of non agricultural activities practiced by farm women's is given below in following table No3.

These non agricultural activities are chosen by them as time pass activity during lean period of farming and during time of regular rainy days and Sevier cold when they can't go outside from their homes. In one hand it provides them a source of subsidiary income after sale of ready products and other hands provides the platform for their engagements also.

Table - 3 : Type of non agricultural activities and preference based ranking and adoptation percentage

S. No.	Type of Non agricultural activities	Activity rank	Preference (%) by the respondents
1	Singka making (Handicraft item)	I	65
2	Sweater weaving (Handicraft item)	II	23
3	Local paper making from wood chips	III	2

Change in Income Pattern of Respondents:

After Implementation of DFI Programme the change in the income of respondents year wise have been recorded in the table No.4

Note: BI =denotes the baseline average Income in the given year

AI= Annual change in income after programme implemetation

Table - 4 : Year wise Change in Income standard of the respondents

S. No.	Year	(BI)/Participants (Rs.) (Year wise)	Change in (AI) annual income (increase in income year wise after adoption of interventions)	
			Increase in monitory value (Rs)	% increase
1	2017-18	60,000	34,000.00	56.66
2	2018-19	94,000.00	41,000.00	43.61
3	2019-20	1,35,000.00	44,000.00	32.59
4	2020-21	179,000.00	33,000.00	18.43
5	2021-22	212,000.00	21000.00	9.90

The table 4 illustrates that before the intervention in the said farmwomen cluster the average income of respondent was Rs60000.00/year from various sources but after intervention it was increased Rs 34000 in 2017-18, Rs 41,000.00 in the year 2018-19, Rs 44,000.00 in 2019-20, Rs 33,000.00 in 2020-21 and Rs 21,000.00 in 2021-22. The findings clearly indicates that there was a continues increase in income of respondents from 2017-20 after that speed of increment in annual income became slower up to 2021 and 2022, whatever increase have been recorded it might be because of increment in price of produce by the respondents. The percentage change in income with reference to baseline income/year was recorded in decreasing trend during all the year of experiment except 1st year *i.e.* year of intervention. It was highest 56.66% in 1st year (2017-18 year of intervention) and lowest 9.90% in 2021-22. In comparison to baseline income of 1st year with the income of all the year of experiment the increase in income of respondents was recorded more than double in 3rd year of the DFI programme while after the 3rd year the speed of increase in income of respondents got slower during 2020-21 & 2021-22.

Identified Technological gaps among different interventions:

The detail of analyzed gap and % change in income because of the interventions made were recorded and presented in Table No.5. Full gap have been observed in the interventions on the Introduction of HYV of rice CAU R-1 & Ranjeet along with scientific management practices, Introduction of SRI in paddy, Introduction of HYV Maize varieties, Low cost Oyster mushroom cultivation, Use of HYV & scientific cultivation and management practices in Ginger & turmeric along with the technology on Nursery raising of temperate fruit crops, where as the partial technological gap have been observed on the interventions of (INM) Integrated Nutrient Management in Rajmash, Income generation activities through seasonal vegetable farming, Backyard Poultry farming and on the intervention of Fish cum Duck farming. Results are in close association Chaturvedi *et. al.* (2024).

The change in yield and income percentage

Table - 5 : Introduced inventions, adoptability gap observed & % change in income

Particulars of interventions	Existing farm practices	Recommended Practice	Gap analyzed	(%)Change in Income due to intervention
Introduction of HYV rice CAU R -1 & Ranjeet along with scientific management practices	Local paddy cultivation with traditional system	Application of Scientific package of practice for paddy cultivation	Full gap	37%
Introduction of SRI in paddy	Local paddy cultivation with traditional system	SRI Techniques on HYV of rice and on local varieties too	Full gap	54%
Introduction of HYV Maize varieties	Use of Local varieties without proper scientific practice	Introduction of HYV Maize varieties	Full gap	68%
(INM) Integrated Nutrient Management in Rajmash	Use of Local varieties without any nutrient management technology	Scientific Integrated nutrient management technology	Partial gap	34%
Introduction of Vermi-composting	New intervention there was no vermin-compost practice earlier	Introduction of low cost Vermi-composting	Full gap	92%
Low cost Oyster mushroom cultivation	New intervention there was no any mushroom cultivation practice earlier	Low cost oyster mushroom cultivation	Full gap	85%
Income generation activities through seasonal vegetable farming	Earlier they were growing only lahi patta with traditional system in thei r kitchen garden only	Introduction of short duration (leafy, cabbage and cauliflower) vegetable farming for income generation	Partial gap	78%
Use of HYV & scientific cultivation and management practices in Ginger *(Zingiber officinali)*	farming at very small scale without scientific package of practice with unknown varieties	Use of HYV & scientific package of practice	Full gap	62%
Use of HYV & scientific cultivation of turmeric	farming at household level without scientific package of practice with unknown varieties	Use of HYV & scientific package of practice	Full gap	53%
Backyard Poultry farming	Use less productive local Breed	Introduction of improved Breed	Partial gap	40%
Fish cum Duck farming	Only carp farming without any integration and scientific practice	Integration with ducklings applying scientific culture practice	Partial gap	74%
Nursery raising of temperate fruit crops	New intervention Earlier they were not known about this practice	Nursery raising of grafted walnut, kiwi, persimon , peach and apple etc for income generation	Full gap	>100%

from different interventions was recorded highest >100 in the intervention of Nursery raising of grafted walnut, kiwi, persimon, peach and apple etc followed by 92% in Vermi-compost production technology as sale price of the ready vermi-compost is almost ranging from Rs.25-30/kg because of high

demand for the flower pots as in the district each house hold is lover of different varieties of flower suitable for the region. The lowest 34% increase was recorded on the interventions of (INM) Integrated Nutrient Management in Rajmash flowed by 37% in Introduction of HYV of rice CAU R-1 & Ranjeet along with scientific management practices and 40% Backyard Poultry farming. Where as in rest of intervention the recorded increment was highest 85% in Low cost Oyster mushroom cultivation technology followed by 78% in Income generation activities through seasonal vegetable farming, 74% in Fish cum Duck farming, 68% in Introduction of HYV of Maize, 62% in Use of HYV & scientific cultivation of Ginger, 54% in Introduction of SRI in paddy, 53% in use of HYV & scientific cultivation of turmeric,

Micro level study on the respondents:

During the experimentation period it has also been observed that education, training exposure and communication exposure had positive significant relationship and age had negative significant relationship in social mobility of rural women. Educated individuals have better insight in many matters and transform respondent's mindset towards desirable directions. The same line of findings were also recorded by Saradha, O., (2001). Training generally increases the knowledge and skills of respondents which enhance the interest of rural women toward the involvement in various farming activities to enhance their income standard. Communication exposure of the rural women had been observed of lower level. The poor exposure to various sources of information is likely to be the root cause for lesser interest in income generating activities among rest of farmwomen.

CONCLUSION

Therefore it is essential to bridge the technological gap by providing better communication and pragmatic programs which will make them aware about recent technological advancement and they will feel more empower in their farming, related allied activities and their social status also.

ACKNOWLEDGEMENT

The authors are highly thankful to beloved respondents from the Chug Village who have taken part in this part of study and also equally thankful to the all 3 Gaon buras, ASM and Mr. Nima Norbu a teacher cum young entrepreneur of said village who were always helped for any study related query as and when required.

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Journal of Natural Resource and Development 19 (2) 12-19, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

STUDY THE IMPACT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND NUTRIENT UPTAKE OF GARLIC (ALLIUM SATIVUM L.) CV. YAMUNA SAFED -2 (G-50)

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Received : 11.04.2024 Accepted : 12.06.2024

ABSTRACT

A field experiment was conducted on Effect of integrated plant nutrient management on growth and yield of brinjal (Solanum melongena L.) cv. Pusa Hybrid-6 at Instructional cum research farm, Department of Horticulture, Kulbhaskar Ashram Post Graduate College Prayagraj (Allahabad) UP. During Rabi season 2023-24. The experiment was laid out in Randomized Block Design (RBD) with 16 treatment of replicated thrice with T0[100% RDF (100N:80P:80 kg/ha)],T1 [5 tones vermicompost], T2[8 tones vermicompost],T3[25 % N and RDF+ 5 tones vermicompost],T4[25 % N and RDF+ 8 tones vermicompost]T5[50 % N of RDF + 5 tones vermicomposT],T6[50 % N of RDF + 8 tones vermicompost],T7[75 % N of RDF + 5 tones vermicompost],T8[75 % N of RDF + 8 tones vermicompost],T9[75 % N of RDF + P&K],T10 [75% N of RDF + recommended dose of P&K],T11[75% N of RDF + recommended dose of P&K + 2 kg Azotobocter],T12[T3 + 2kg Azotobacter /ha],T13[T5 + 2kg Azotobacter /ha],T14[T6 + 2kg Azotobacter /ha] T15[T7 + 2kg Azotobacter /ha]

Keywords : *INM, brinjal, growth, yield, quality, biofertilizers*

INTRODUCTION

Garlic (Allium Sativum), is a tiny crop of underground bulbs. The Ayurvedic term for garlic crop is "Nectar of life" The most significant commercial crops grown are medicinal, spices, and bulbs. Garlic is the second most widely used spice after onions due to its strong odor . It is also known as the stinking rose. It originated in central Asia, extending from the mountainous (southern) region of Turkmenia to Punjab, the Pamir-Alai, and the Tien Shan region in the east. Its benefits have persisted since it first arrived in the Mediterranean region during prehistoric times. More than in any other part of the world, cherish perhaps. Before 3000 BC, models of garlic bulbs were discovered in pre-dynamic Egypt. It made its way to China and has long since grown there as well as in India. Introduced to the western hemisphere by the French and Spanish, it is primarily grown and used in countries with a temperate climate and in regions where South Europeans have settled. Garlic is an annual herbaceous crop used for bulb production. It belongs to the genus Allium, family Alliaceae, and has a suppositive chromosome number of 2n=2x=16. Asia and south Europe are the primary centers of origin for garlic crops, with the

secondrycenter of origin region being the Mediterranean (Thompson and Kelly 1957)

Since ancient times, garlic has piqued the interest of both physicians and the general public. White-colored garlic bulbs have been discovered during tomb excavations. Due to its widespread usage throughout the world and the widely held belief that it has kept people healthy, garlic has garnered special attention. Garlic cultivation worldwide The world's leading garlic-growing nations are China, India ,Korea, USA, Egypt, Russia, Spain, Thailand turkey, and Argentina however china is the world's largest producer Garlic was produced in 28.05 MT tons worldwide in 2021. Seventy-four percent of global production comes China. India produces 3.2 MT, and China produces 20.5 MT. Korea, South 0.8 MT Egypt 0.3 MT, Bangladesh 0.5 MT Spain 0.3MT. [Source: Organization for Food and Agriculture, 2021] Madhya Pradesh is India's top state in terms of production of garlic; other top-producing states include Gujarat, Orissa, Maharashtra, Rajasthan, and Uttar Pradesh Is the efficient method of utilization of all available resources to increase the growth yield and quality and to attain maximum benefit from the crop. This optimizes the benefit from all possible sources of plant nutrients in an integrated nutrient management package. INM is not only important from the economic point of view but also from the point of view of environmental pollution and associated health hazards. it is the most effective and practical way to mobilize all the available accessible and affordably plant nutrient sources to optimize the productivity of the cropping system The concept of INM aims at maintaining or enhancing soil fertility and plant nutrient supply at an optimum level to sustain the desirable crop productivity through the lower productivity in India is due to inherent low yield potential of garlic cultivars susceptibility of cultivars to disease and pest not the availability of genuine planting material, inadequate irrigation nutrient, and post-harvest management the continuous and imbalance use of fertilizer is adversely affected the sustainability of agriculture production beside causing environmental pollution.

In India the main reason for lower productivity is due to inadequate and improper adoption is due to inadequate and improper adoption of scientific agronomic practice, insect, pest, and disease management the adoption of cultural practice in a more scientific manner will certainly enhance the growth and yield of garlic.

Integrated nutrient management provides an excellent opportunity to overcome all the imbalances besides sustaining soil health and enhancing crop production which involves organic manure, chemical fertilizer, biofertilizer, etc. optimization of benefits from all possible sources of plant nutrients in an integrated manner, so the proper blending of chemical fertilizer, organic manure and biofertilizer will not only improve the soil health but also helps to maximize the crop productivity.

Some evidence indicates that taking garlic can slightly lower blood cholesterol levels preliminary research suggests that taking garlic may slow the development of atherosclerosis a slow condition that can lead to heart disease or stroke. evidence suggests that taking garlic may slightly lower blood pressure part in people with high bp garlic as a regular part of the diet may lower the risk of certain cancers the main aim of investigation was foundout of the.“Study The impact of Integrated Nutrient Management on Growth, Yield, and Nutrient uptakeof Garlic”.

MATERIALS AND METHODS

The present experiment was conducted at the farm of the Department of Horticulture, Kulbhaskar Ashram post-graduate College,

Prayagraj during the rabi season 2023-2024.This variety of garlic Yamuna Safed -2(G-50) was used to carried out a Randomized block design within three replication and number of treatments were.

Treatment combination

Detailed treatment combinations

T_1 : Control

T_2 : 100 % RDF (150:80:60)Kg/hectare(NPK)

T_3 : 100% Vermicompost

T_4 : 100% Farm yard manure

T_5 : 100% Vermicompost +Azospirillum

T_6 : 50% sulphur +50% FYM

T_7 : 50 % Vermicompost +50 % FYM +Azospirillum

T_8 : 25% Zinc +25% sulphur +25% vermicompost +25% RDF+Azospirillum

T_9 : 100% RDF +Azospirillum

T_{10} : 50 % RDF +50% Vermicompost.

T_{11} : 50% FYM +50 % Vermicompost

A total of thirty-three 3.3 x 2.7 m2 plots were transplanted on 13/12/2023 with a 15 x 10 cm spacing. Hoeing, weeding, and irrigation were given to the plants at the appropriate times throughout their life cycle to help with better crop growth and development. Plant height (cm), leaf length per plant, number of leaves per plant, neck thickness (cm), pseudo-stem length (cm), dry weight of bulb (g), bulb polar diameter (cm), bulb equatorial diameter (cm), length of clove (cm), and width of cloves (cm) are some of the observations that were noted. Nutrient uptake by bulb kg/ha, nutrient uptake by haulm kg/ha, total nutrient uptake kg/ha, weight of clove per bulb (g), weight of bulb per plant (g), yield per plot (kg), yield of bulb quintal/ha, and weight of haulm q/ha.

RESULTS AND DISCUSSION

Growth Parameter

Table - 1: Effect of INM on plant height in garlic

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	Control	24.10	41.38	55.67	58.03
T_2	100%RDF(150:80:60)Kg/hectare	24.86	44.52	59.98	62.34
T_3	100%Vermicompost@6Tones	25.40	45.52	61.00	63.36
T_4	100%Farmyardmanure@24tones	24.45	45.01	59.78	62.14
T_5	100%Vermicompost@6tones/150:80:60)Kg	25.39	44.83	61.96	64.32
T_6	50%sulphur+50%FYM	26.19	46.34	62.16	64.52
T_7	50%Vermicompost+50%FYM+Azospirillum	27.12	46.76	62.36	64.72
T_8	25%Zinc+25%sulphur+25%vermicompost +25%RDF+Azospirillum	27.54	48.11	64.28	66.64
T_9	100%RDF+Azospirillum	24.85	44.83	59.14	61.50
T_{10}	50%RDF+50%Vermicompost	24.14	44.60	62.05	64.41
T_{11}	50%FYM+50%Vermicompost	25.72	45.15	59.47	61.83
F-test		S	S	S	S
S.Ed.(±)		0.431	0.484	0.614	0.646
SE(m)		0.305	0.343	0.434	0.457
		0.862	0.969	1.229	1.292

Various doses of inorganic, organic, and biofertilizer improved the vegetative growth parameters of garlic significantly. The treatment containing T8 25% Zinc + 25% Sulphur + 25% Vermicompost + 25% RDF + Azospirillum produced the tallest plants at 30, 60, 90, and 120 days after sowing, with measurements of 27.54 cm, 48.11 cm, 64.28 cm, and 66.64 cm. On the other hand, the lowest plant height was recorded at all growth stages under control T1 24.10 cm, 41.38 cm, 55.67 cm, and 58.03 cm at 30, 60, 90, and 120 DAS, respectively.

NUMBER OF LEAVES PER PLANT

When the plants received all of the T8, the highest number of leaves per plant was produced. 25% zinc+, 25 %sulfur+, 25 % vermicompost,+ 25 % RDF, + 25 %azospirillum at 30, 60, 90, and 120 correspondingly. The minimum number of leaves per plant is displayed by the controlT1 at 3.5, 4.4, 6.80, and 6.90 at 30, 60, 90, and 120 DAS, respectively. Previous research by Jayathilake et al. (2002) and Yadav (2015) also revealed similar results.

Table- 2 : Effect of INM on No. of leaves per plant in garlic

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	Control	3.73	5.44	6.80	6.90
T_2	100%RDF(150:80:60)Kg/hectare	3.90	5.47	7.00	7.10
T_3	100%Vermicompost@6Tones	3.77	5.93	7.40	7.50
T_4	100%Farmyardmanure@24tones	4.17	6.30	8.20	8.30
T_5	100% Vermicompost@6tones/hect+Azospirillum	4.10	6.27	7.40	7.50
T_6	50%sulphur+50%FYM	4.10	6.00	8.00	8.10
T_7	50%Vermicompost+50%FYM +Azospirillum	4.23	6.40	8.40	8.50
T_8	25%Zinc+25%sulphur+25%vermicompost +25% RDF+Azospirillum	4.57	6.73	8.80	8.90
T_9	100%RDF+Azospirillum	3.90	5.73	7.40	7.50
T_{10}	50%RDF+50%Vermicompost	3.86	5.47	7.80	7.90
T_{11}	50%FYM+50%Vermicompost	3.83	5.73	7.60	7.70
F-test		S	S	S	S
S.Ed.(±)		0.149	0.211	0.519	0.445
SE(m)		0.105	0.149	0.367	0.314
C.D.(P=0.05)		0.297	0.423	1.038	0.890

LENGTH OF LEAVES (CM)

At 30, 60, 90, and 120 DAS, the longest leaves were measured at 24.15 cm, 45.80 cm, 47.80 cm, and 48.97 cm. These measurements were made in the plot that received T8 25% Zinc + 25% Sulphur + 25% Vermicompost + 25% RDF + Azospirillum treatment. Nonetheless, the control group (T1) exhibited the shortest length measurements, measuring 18.54 cm, 31.13 cm, 33.19 cm, and 34.36 cm at 30, 60, 90, and 120 DAS. Correlating the experiment's observations with the research conducted by Patil et al.(2007), Islah (2010), Sachin et al.

Table – 3 : Effect of INM on Length of leaves (cm) of garlic

Treatments		30DAP	60DAP	90DAP	120DAP
T_1	Control	18.54	31.13	33.19	34.36
T_2	100%RDF(150:80:60)Kg/hectare	19.85	41.50	43.50	44.67
T_3	100%Vermicompost@6Tones	20.87	42.52	44.52	45.69
T_4	100%Farmyardmanure@24tones	19.65	41.30	43.30	44.47
T_5	100%Vermicompost@6tones/150:80:60)Kg	21.83	43.48	45.48	46.65
T_6	50%sulphur+50%FYM	22.03	43.68	45.68	46.85
T_7	50%Vermicompost+Azospirillum+50% FYM	22.23	43.88	45.88	47.05
T_8	25%Zinc +25% sulphur +25%vermicompost+25% RDF+Azospirillum	24.15	45.80	47.80	48.97
T_9	100%RDF+Azospirillum	19.01	40.66	42.66	43.83
T_{10}	50%RDF+50%Vermicompost	21.92	43.57	45.57	46.74
T_{11}	50%FYM+50%Vermicompost	19.34	40.99	42.99	44.16
F-test		S	S	S	S
		0.413	0.446	0.557	0.479
SE(m)		0.292	0.315	0.394	0.338
C.D.(P=0.05)		0.826	0.892	1.114	0.957

YIELD ATTRIBUTED PARAMETER

Among the harvest Measured at different growth stages (30, 60, 90, and 120 days after sowing), garlic's attributed parameters, such as dry weight of plant (23.49g), diameter (both polar and equilateral) (3.50cm), (4.50cm), and number of cloves per bulb (23.50), were recorded highest. and provide the data on the various yield-attributed parameters of garlic under the T8 25% Zinc + 25% Sulphur + 25% Vermicompost + 25% RDF + Azospirillum treatment combination. The T1 control group had the lowest yield attribute parameter.

Table - 4 : Yield attributed parameter OG Garlic

Treatments		Dryweight ofplant	Polar diameter	Equatorial diameter	Number ofclove/bulb
T1	Control	14.26	2.63	3.72	18.06
T2	100%RDF(150:80:60)Kg/hectare	17.09	2.83	3.89	23.23
T3	100%Vermicompost@6Tones	18.69	2.70	3.76	23.10
T4	100%Farmyardmanure@24tones	18.65	3.10	4.16	23.50
T5	100%Vermicompost@6tones/150:80:60)Kg	18.02	3.08	4.14	23.43
T6	50%sulphur+50%FYM	19.15	3.03	4.09	23.43
T7	50%Vermicompost+50%FYM+Azospirillum	20.75	3.16	4.22	23.56
T8	25%Zinc+25%sulphur+25%vermicompost +25%RDF+Azospirillum	23.49	3.50	4.56	23.90
T9	100%RDF+Azospirillum	21.82	2.83	3.89	23.23
T10	50%RDF+50%Vermicompost	18.78	2.79	3.85	23.19
T11	50%FYM+50%Vermicompost	19.02	2.76	3.82	23.16
F-test		S	S	NS	S
S.Ed.(±)		0.575	0.025	0.413	0.384
SE(m)		0.406	0.017	0.292	0.272
C.D.(P =0.05)		1.150	0.049	0.826	0.768

NUTRIENT UPTAKE

Nutrient uptake by bulb(Kg/ha)

The ability of the garlic bulb to absorb nitrogen, phosphorus, and potash is impacted by different treatment combinations. The highest nutrient uptake of garlic (173.74 kg/h), (40.77 kg/ha), and (73.91 kg/ha) was recorded in T8, which received the recommended dose of NPK. The lowest NPK was recorded in control T1, at 116.34 kg/ha, (18.34 kg/ha), and 59.00 kg/ha.

Table - 5 : Nutrient uptake by bulb

Treatments		Bulb		
		N	P	K
T_1	Control	116.34	18.34	59.00
T_2	100%RDF(150:80:60)Kg/hectare	133.52	23.55	65.18
T_3	100%Vermicompost@6Tones	130.58	20.61	63.69
T_4	100%Farmyard manure@24tones	144.70	34.73	60.71
T_5	100%Vermicompost@6tones/150:80:60)Kg	140.98	31.01	67.95
T_6	50%sulphur+50%FYM	146.20	36.23	66.03
T_7	50%Vermicompost+50%FYM +Azospirillum	165.96	32.99	71.99
T_8	25%Zinc+25%sulphur+25%vermicompost +25%RDF+Azospirillum	173.74	40.77	73.91
T_9	100%RDF+Azospirillum	162.30	34.33	67.10
T_{10}	50%RDF+50%Vermicompost	149.28	28.31	71.14
T_{11}	50%FYM+50%Vermicompost	150.18	29.21	70.08
F-test		S	S	S
S.Ed.(±)		2.064	0.828	1.092

CONCLUSION

Based on the current investigation's results, the best treatment for increasing plant height, number of leaves, length and width of leaves, and ultimately growth and quality was determined to be 25% Zinc + 25% Sulphur + 25% Vermicompost + 25% RDF + Azospirillum. These treatments were found to be significantly at par with each other in most cases.

ACKNOWLEDGMENT

The authors would like to express their gratitude to the Department of Horticulture at Kulbhaskar Ashram Post-Graduate College Prayagraj (UP) for providing all the facilities.

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Journal of Natural Resource and Development 19 (2) 20-26, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF CHILLI (CAPSICUM ANNUUM L) CV. KASHI RATNA

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Received : 20.05.2024 Accepted : 25.07.2024

ABSTRACT

A field experiment was conducted on "Effect of integrated nutrient management on growth, yield and quality of Chilli atKulbhaskar Ashram Post Graduate College, Prayagraj during rabi season of the year 2023-24. The experiment was laid out in a randomized block design with three replications and 10 treatments. T_1 (100 % RDF (NPK) Control), T_2 (75 % RDF + 25 % FYM), T_3 (50 % RDF + 50 FYM), T_4 (25 % RDF + 75 % FYM), T_5 (75 % RDF + 25 % Vermicompost), T_6 (50 % RDF + 50 % Vermicompost), T_7 (25 % RDF + 75 % Vermicompost), T_8 (75 % RDF +25 % Poultry Manure), T_9 (50 % RDF + 50 % Poultry Manure), T_{10} (25 % RDF + 75 % Poultry Manure). The result showed that the treatment T_9 (50 % RDF + 50 % Poultry Manure)gave maximum and significantly, plant height (28.10, 44.03 ,67.26 and 73.41 cm), Number of Branches (9.20, 13.65, 17.12 and 19.75)and Number of leaves (40.64, 62.16, 88.43, and 110) in 30, 60, 90 and 120 DAT respectively, Days to 1st flowering (57.12DAT), Days to 50% flowering (68.63 DAT), Number of fruit per plants (105.38), Fruit length (9.66 cm), Average fruit weight per plant (.271 kg.), Fruit yield (20.125.t/ha), Ascorbic acid (165 mg/100g), Capsaicin (0.52%). Application of T_9 (50 % RDF + 50 % Poultry Manure) significantly superior to other treatments.

Keywords : *INM, chilli, growth, yield, quality*

INTRODUCTION

Chilli (*Capsicum annuum* L.) belonging to family Solanaceae, chromosome no. is 2n=2x=24 is grown as an annual crop. It is a tropical and subtropical vegetable crop grown all over the country in India. Chilli was originated in tropical America. In the 16th century the Portuguese were the first to introduce them to India. Its cultivation became more common in the 17th century. Chilli is a day natural crop. It is often cross-pollinated crop, herbaceous or semi-woody annual. The plants are erect, profusely branched and 0.5-1.5 m height with taproots that are restricted after transplanting. The leaves are simple and variable in size, flowers are bisexual and white in colour. The fruits are borne singly at nodes, variable in size, shape, colour and pungency. The unripe fruits are green or purplish, ripening to red or orange, yellow, brown, cream or

purplish and the seeds are pale yellow.Chilli grown for its fruit. popularly known as "King of spices". It is grown throughout the year and used to green and red rip dried stage for their pregnancy and colour. The chillies are unique being used both as vegetable and spice.

In the world the major chilli growing countries are India, China, Mexico, Japan, Uganda, Nigeria, Thailand, Turkey, Indonesia, and Pakistan. In India, chillies are grown all over the country, particularly around big cities and towns for fresh consumption. The major chill growing states of the country are Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu, Punjab, Haryana, Bihar and Uttar Pradesh.

The integrated nutrient management (INM) is a holistic approach of nutrient management aims at efficient and judicious use of all the major sources of plant nutrients i.e., organic, inorganic and biological components in an integrated manner, so as to get maximum economic yield without any deleterious effect on physio-chemical and biological properties of the soil.

Hence, efficient and judicious use of the chemical fertilizers along with organic manure is imperative not only for obtaining more yield per unit area on a sustainable basis but also to conserve the energy and to avoid the problem of environment quality. The nutrient demand for chilli is different from other vegetables because of its quicker growth, continuous fruiting habit andheavy yield. Being a heavy feeder and exhaustive crop, chilli responds very well to nutrient application and therefore it should be applied in right doses in right time and through suitable method so that better growth and development is attained that will ensure higher fruit yield. Chilli requires large quantities of both organic and inorganic nutrients for its economic yields. The nutrient needed for chilli crop should be supplied through organic, inorganic source.

Therefore, in order to get a better yield and good quality, integrated nutrient management is taken into consideration while keeping in mind the negative effects of using simply chemical fertilizers. The combined use of organic manures, chemical fertilizers is today's requirement and is being advocated for sustainable agriculture. Integrated nutrient management plays a vital role in sustainable crop production by reducing the use of chemical fertilizers and incorporating organic manures without harming soil quality, which is a valuable resource for sustainable agriculture. The main aim of investigation was found out of the "Effect of integrated nutrient management practices on growth, yield and quality of Chilli".

MATERIALS AND METHODS

The experiment was conducted at the farm of Department of Horticulture, Kulbhaskar Ashram Post Graduate College, Prayagraj, Uttar Pradesh during rabi season 2023-2024. The experiment was laid out in randomized block design in three replications and number of treatments were 10.

There were altogether 30 plots each of 4.5×3.0 m2 size. Transplanting was done on 19/10/2023 with spacing 30 x 45 cm. During the life cycle of the plants, hoeing, weeding and irrigation were provided at proper time so as facilitate better growth and development of crop. The observation was recorded *i.e.* Plant height (cm), Number of branches per plant, Number of leaves per plant, Days taken to first flowering, Fruit set (%), Days taken to first picking, Number of fruits per plant, Fruit weight per plant (kg), Fruit weight per plot (kg), Green chilli yield per ha. (Kg.), Length of fruit (cm), Ascorbic acid (mg/100g) and Capsaicin %.

Notations	Treatment Combination	Doses
T_1	100 % RDF (NPK) Control	120:60:50 Kg/ha
T_2	75 % RDF + 25 % FYM	90:45:37.5 Kg/ha + 6.25 t/ha
T_3	50 % RDF + 50 % FYM	60:30:25 Kg/ha + 12.50 t/ha
T_4	25 % RDF + 75 % FYM	30:15:12.5 Kg/ha + 18.75 t/ha
T_5	75 % RDF + 25 % Vermicompost	90:45:37.5 Kg/ha + 1.25 t/ha
T_6	50 % RDF + 50 % Vermicompost	60:30:25 Kg/ha + 2.50 t/ha
T_7	25 % RDF + 75 % Vermicompost	30:15:12.5 Kg/ha + 3.75 t/ha
T_8	75 % RDF +25 % Poultry Manure	90:45:37.5 Kg/ha + 1.25 t/ha
T_9	50 % RDF + 50 % Poultry Manure	60:30:25 Kg/ha + 2.50 t/ha
T_{10}	25 % RDF + 75 % Poultry Manure	30:15:12.5 Kg/ha +3.75 t/ha

RESULTS AND DISCUSSION

Growth parameters

Height of plant (cm)

Plant height is an important index of plant growth. Plant height is measured to determine the relative differences in plant growth rates, reflected to treatment effects.

At 30, 60, 90 and 120 days after transplanting, the significantly maximum height of plant was found in T_9 - 50% RDF + 50% Poultry Manure (28.10 cm), (44.03 cm), (67.26 cm) and (73.41 cm) Whereas, height of plant was minimum in treatment T_1(100 % RDF (NPK) Control) (21.30 cm), (34.50 cm), (45.20 cm) and (52.11 cm).

Number of branches per plant

The branches are the skeletal structure of the plant. The number of branches indicates the growth of the plant and it may affect the yield significantly. Observations on the number of branches per plant were recorded at 30 days interval up to 120 days after transplanting (DAT).

At 30, 60,90 and 120 days after transplanting, the significantly maximum number of branches of plant was found in T_9 - 50% RDF + 50% Poultry Manure (9.20), (13.65), (17.12), (19.75). Whereas, number of branches of plant was minimum in treatment T_1(100 % RDF (NPK) Control).

These results are in conformity with the findings of Chougule and Mahajan (1979), Mishra and Singh (2005), Vitkar*et al.,* (2007).

Number of leaves per plant:

At 30, 60, 90 and 120 days after transplanting, the significantly maximum number of leaves of plant was found in T_9 - 50% RDF + 50% Poultry Manure (40.64), (62.16), (88.43), (110). Whereas, number of branches of plant was minimum in treatment T_1 (100 % RDF (NPK) Control).

Yepthoet *al.,* (2012) reported that application of 50% NPK + 50% Poultry manure + biofertilizer recorded maximum number of leaves

plant'1 in tomato.

Phenological parameters

Days to I st flower initiation and 50 % flowering

Days to I st flower initiation as affected by combination of organic and inorganic fertilizers. The data revealed that there was significant effect of various treatments on I st flower initiation period the treatment T_9 (50 % RDF + 50 % Poultry Manure) (57.12 DAT). Whereas, maximum number of days required to I st flower initiation was recorded in treatment T_1 (100 % RDF (NPK) Control) (69.34 DAT)

Flowering was initiated earlier also had earlier 50% flowering. The treatment T_9 (50 % RDF + 50 % Poultry Manure) resulted earlier 50% flowering (68.63 DAT) within minimum number of days. Whereas, maximum number of days required to 50% flowering was recorded in treatment T_1 (100 % RDF (NPK) Control) (81.53 DAT), Pariari and Khan, (2013) in chilli. Early flowering brought out by combined treatments can be attributed to synergistic effect, early in vigour plant growth might have helped in synthesizes of cytokinin by this plant. Synthesized cytokinin and phosphorus through xylem and vessels, Vitkar*et al.,* (2007).

Fruit set (%)

The maximum fruit set % (98.26 %) were recorded under T_9 (50 % RDF + 50 % Poultry Manure). The minimum fruit set % (82.16 %) were recorded under $T_{1(}$100 % RDF (NPK) Control).

These results are confirmed with the findings of Mondal.*et al.,*(2003), Natarajan (1990), Talikder and Jana (2009), Singh *et al.,* (2010).

Days taken to first picking:

Significantly maximum days to 1st harvesting after transplanting (101.59 days) were recorded at $T_{1\ (}$100 % RDF (NPK) Control). The minimum days required to I st harvesting after transplanting (87.49 days) was significantly recorded under T_9 (50 % RDF + 50 % Poultry Manure).These results are in conformity with the findings of Malawadi (2003), Uppar*et al.,* (2008), Singh *et al.,* (2010).

Yield Parameters

Number of fruits per plant

Levels of treatments have produced significant effect on the number of fruits per plant. The maximum number of fruits per plant (105.38) was found with treatment T_9 (50 % RDF + 50 % Poultry Manure) and the minimum number of fruits (78.17) was recorded under $T_{1\ (}$100 % RDF (NPK) Control).

These results are in conformity with the findings of Balara) (2007) (2002), Sarma *et al.,*(2004), Sajan*et al.,* (2002) Mishra and Sinh (2005), Vitkar*et al.,* (2007).

Fruit weight per plant (kg.)

Highest fresh weight of fruits per plant (0.271 kg) was recorded under T_9 (50 % RDF + 50 % Poultry Manure). The minimum fresh weight of fruits was recorded (0.201 kg) under $T_{1(}$100 % RDF (NPK) Control). These results are in agreement with the result reported by Patil *et al.,* (2004) in tomato and Kondapa*et al.*, (2009) in chilli.

Fruit weight per plot (kg.)

Significantly maximum fresh weight per plot (27.1 kg) was recorded under T_9 (50 % RDF + 50 % Poultry Manure). The minimum fresh weight per plot was recorded (20.1 kg) under $T_{1(}$100 % RDF (NPK) Control). Similar results under the combination of different fertilizers along with organic manure and inorganic treatments were reported by Chavan etal. (1997), Malawadi (2003), Sajan *et al.,* (2002), Talikder and Jana (2009).

Green chilli yield per ha. (t/ha.)

The maximum yield of green chilli per ha.

were recorded (20.125 t/ha) T_9 (50 % RDF + 50 % Poultry Manure) and the minimum yield of green chilli was recorded (14.959 t/ha.) under T_1 (100 % RDF (NPK) Control). The results are in conformity with the findings of Chavan *et al.,* (1997)

Quality Parameters

Length of Fruit (cm)

The present studies indicated that the fruit length was non-significantly influenced by different treatments. The maximum fruit length was recorded (9.66 cm, 9.20 cm and 8.77 cm). respectively under the treatments T_9 (50 % RDF + 50 % Poultry Manure), T_6 (50 % RDF + 50 % Vermicompost), T_3 (50 % RDF + 50 FYM). The minimum fruit length (5.37 cm) was recorded under T_1 (100 % RDF (NPK) Control). The result is supported with the findings of Shamima and Islam (1990), Mishra and Singh (2005) in okra, Singh *et al.,* (2010), Vitkar*et al.,* (2007).

Ascorbic acid content

According the data the maximum ascorbic acid content (165 mg/100g) in the treatment of T_9 (50 % RDF + 50 % Poultry Manure). The minimum ascorbic acid (138 mg/100g) was recorded under T_1 (100 % RDF) under the control treatment.

Similar result of increase quality in vermicompost treated plot were reported by Gavrilov (1962) and Tomati *et al.,* (1983).

Capsaicin %

According the data the maximum capsaicin % (0.52 %) was found in the treatment of T_9 (50% RDF + 75% Poultry Manure) and the minimum capsaicin (0.36 %) was recorded under T_1 (100% RDF) under the control treatment.

These results are in conformity with the finding of Naveen *et al.,* (2009), while working with nutrition aspect and quality of green chilli.

Table - 2 : Effect of integrated nutrient management on growth attributes of chilli.

Treatments	Plant height (cm)				Number of branches per plant				Number of leaves per plant			
	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT	30 DAT	60 DAT	90 DAT	120 DAT
T_1	21.30	34.50	45.20	52.11	5.12	7.42	10.56	11.26	29.62	47.58	65.71	88.02
T_2	22.47	36.45	47.95	54.82	5.92	8.38	11.39	12.54	30.12	49.3	68.41	90.47
T_3	25.66	39.93	58.64	65.36	8.40	12.20	15.87	16.12	38.08	58.95	80.89	102.93
T_4	24.10	38.30	53.00	58.57	6.84	10.67	14.20	14.96	34.52	54.01	76.05	97.98
T_5	23.00	37.30	50.50	55.89	6.08	8.96	12.44	13.86	32.52	50.79	70.96	92.96
T_6	27.30	42.20	62.09	69.13	8	12.88	16.74	17.33	39.28	60.45	85.89	107.73
T_7	25.15	39.10	55.90	60.93	7.55	11.12	14.89	15.74	35.92	55.83	78.59	100.78
T_8	23.95	38.12	52.68	57.49	6.33	9.45	13.66	14.21	33.42	52.51	73.45	95.69
T_9	28.10	44.03	67.26	73.41	9.20	13.65	17.12	19.75	40.64	62.16	88.43	110
T_{10}	25.33	39.50	58.21	63.29	7.96	11.50	15.13	16.02	37.28	57.23	83.29	105.43
SE(m)±	**0.2666**	**0.250**	**0.194**	**0.171**	**0.044**	**0.0255**	**0.0560**	**0.322**	**0.151**	**0.178**	**0.148**	**0.124**
CD at 5%	**0.786**	**0.738**	**0.573**	**0.504**	**0.131**	**0.0753**	**0.165**	**0.950**	**0.446**	**0.525**	**0.439**	**0.366**

Table - 3 : Effect of integrated nutrient management on yield and quality attributes of chilli.

Treatments	Days After Transplanting		Fruit set %	Days taken to I[st]picking	Number of fruits per plant	Fruit weight per plant (kg.)	Fruit weight per plot (kg.)	Green chilli yield per ha. (t/ha.)	Length of Fruit (cm)	Ascorbic acid (mg/100g)	capsaicin %
	I[st]Flower initiation	50% flowering									
T_1	69.34	81.53	82.16	101.59	78.17	0.201	20.1	14.959	5.37	138	0.36
T_2	67.54	79.74	85.53	99.76	83.48	0.210	21.0	15.609	5.87	142	0.39
T_3	59.74	71.37	95.89	90.15	99.93	0.255	25.5	18.955	8.77	158	0.49
T_4	63.61	75.31	90.26	94.72	93.64	0.233	23.3	17.331	7.21	151	0.44
T_5	66.04	78.14	87.38	98.08	86.72	0.217	21.7	16.124	6.26	145	0.40
T_6	58.39	69.97	96.92	88.65	102.30	0.267	26.7	19.807	9.20	162	0.50
T_7	62.26	73.78	92.84	93.3	95.56	0.240	24	17.827	7.81	154	0.46
T_8	64.81	76.64	88.13	96.61	90.61	0.226	22. 6	16.807	6.71	148	0.42
T_9	57.12	68.63	98.26	87.49	105.38	0.271	27.1	20.125	9.66	165	0.52
T_{10}	60.99	72.59	93.46	91.95	97.97	0.248	24.8	18.439	8.31	157	0.47
–	**0.043**	**0.0199**	**0.704**	**0.809**	**3.324**	**0.0030**	**0.146**	**11.891**	**0.30**	**2.90**	**2.10**
CD at 5%	**0.129**	**0.0587**	**2.079**	**2.386**	**9.808**	**0.0088**	**0.432**	**35.081**	**0.88**	**5.88**	**5.23**

CONCLUSIONS

All the treatment show significantly differences for most of the trait under study. The treatment T_9 (50 % RDF + 50 % Poultry Manure), was found as the best treatment for majority of traits viz. Plant height (cm), Number of branches per plant, Number of leaves per plant, Days taken to first flowering, Fruit set (%), Days taken to first picking, Number of fruits per plant, Fruit weight per plant (kg), Fruit weight per plot (kg), Green chilli yield per ha. (Kg.), Length of fruit (cm), Ascorbic acid (mg/100g) and Capsaicin %.

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Journal of Natural Resource and Development 19 (2) 27-42, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

STUDIES ON THE EFFECT OF INTERGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF ONION (ALLIUM CEPA L.) CV. N-53

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Received : 29.04.2024 Accepted : 31.06.2024

ABSTRACT

The present field experiment entitled" Effect of intergrated nutrient managemet on growth, yield and quality of onion *(Allium cepa)*cv. N-53" was carried out during Rabi season of the year 2023-2024 at Kulbhaskar Ashram Post Graduate College, Prayagraj (U.P.). The result and conclusion of the about experiment are briefly explain here. The experiment was laid out in a randomized block design with 3 replication and 11 treatments viz. T1control, T2100% RDF (150:80:60 kg/ha.), T3 (100% Vermicompost @6 Tonnes), T4(100% Farmyard manure @24 Tonnes), T5(100% Vermicompost@ 6 Tonnes + Azospirillum), T6(50% Sulphur + 50% FYM), T7(50% Vermicompost + 50% FYM + Azospirillum), T8(25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum), T9(100% RDF + Azospirillum, T1050% RDF + 50% Vermicompost), T11(50% FYM + 50% Vermicompost). The result showed that the treatmentT8 (25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum) gave maximum and significantly, Plant height(20.41 cm, 30.91 cm, 43.11 cm, 45.47 cm), Diameter of stem(2.65 cm, 2.80 cm, 2.88 cm, 2.96 cm), Number of leaves per plant (4.44 cm, 6,53 cm, 8.70 cm,9.06 cm),Length of leaves(47.28 cm, 47.96 cm, 48.90 cm, 49,38 cm), Fresh weight of leaves(34.01 g. 34.69 g. 35.30 g. 35.79 g.), Dry weight of leaves(3.56 g. 3.64 g. 3.63 g. 4.12 g). In 30, 60, 90, 120 DAT.

Keywords : *INM, onion, growth, yield.*

INTRODUCTION

Onion (*Allium cepa* L.) is the most important vegetable crop of the family alliacea. Chromosome number x =8 (2n=16). The primary centre of origin of onion in central asia. The genus allium having about 300 species. The type of inflorescence of onion is umbel. It is a tunicated bulb which developes in the soil. Grown as species and vegetable crop and is used for culinary purpose.It is an indispensable item in every kitchen as getable and condiment used to flavor many at the stuffs. Therefore, onion is popularly known as 'Queen of kitchen' in addition onion is used as salad and pickle.

The main onion growing state in India are Maharashtra, Madhya Pradesh, Karnatakan, Gujrat, Rajasthan, Bihar, West Begal, Andhra Pradesh, Tamil Nadu, Haryana, Uttar Pradesh, Chattisgarh, Orisha, Jharkhand, Punjab.Maharashtra is the leading onion growing state which contributes about 30% of country production. The other important states are Karnataka, Gujarat, Rajasthan, Uttar Pradesh and Tamil Nadu.

India production as onion for the year 2022 with share in Maharashtra (42.73%), Madhya Pradesh (15.23%) Karnataka (8.93%), Gujarat (8.21%), Rajasthan (4.65%), Bihar (4.42%), West Bengal (2.77%), Andhra Pradesh (1.63%), Tamil Nadu (1.79%), Haryana (1.65%), Uttar Pradesh (1.63%), Chattisgarh (1.77%), Orisa (1.15%), Punjab (0.79%).

Leading onion production countries with share in production are India (25.00%) China (22.67%) Egypt (3.11%) USA (2.21%) Turkey (2.35%) Pakistan (2.16%) Bangladesh (2.13%) Sudan (1.92%)

The world onion export for the year 2022 with export share in Netherland (17.18%), India (13.14%), Mexico (11.82%), China (8.39%), Spain (6.20%), USA (6.07%), Peru (4.0%), Egypt (3.92%), Poland (3.26%), New Zealand (2.46%),

Onion bulb is rice in minerals, especially calcium, potassium and phosphorus besides having fairly good quantities of corbohydrates, proteins and vitamin. The bulb is composed at Chorbohydrates (11.0g) proteins (1.2g) fiber (0.6g) moisture (86.8g) and energy (38 cal). Apart from these vitamins like Vitamin C (11 mg) thiamin (0.08mg) riboflavin (0.01mg) and niacin (0.02mg). Apart from these minerals like, phosphorous (39 mg) calcium (27mg) sodium (1.0 mg) iron (0.7mg) and potassium (1.57mg). The pungency in onion is due to the presence of volatile oil 'allyl propyl disulphide' ($C_6H_{12}S_2$). The red colour of onion bulb is due to the presence of 'Anthocyanin' and yellow colour of onion due to the 'quercetin'. Studies showed that eating moderfate amjounts (<200 g of onion/week) results in less tendency to form blood clots and lower levels of cholesterol and lipoproteins associated with heart diseases in their blood serum than in abstainers.Although the nutritive value ofonion is low. It is greater valued for its inevitable and extensive usage as a vegetable and medicine as well. It forms an indispensable part of many diets of both vegetarian and non vegetarian as a floweuring agents. It is also consumed as salad regularly. The pungency in onion is due to a vegetative compound known as 'allyl propyle disulphide', onion is sulphur rich compound as is also known to posses antibacterial properties.

Onion are grown on a wide range of climatic conditions. However most of the varieties are grown as winter crops in North India. While in Maharashtra and other Southern States as rainfed or autumn season crop. The moderate temperature (100C to 280C) and lease soil mature (Sandy loom) favour the scope of cultivation of onion in north eastern region, but low photoperiodic availability with lack of assured moisture supplied during wither months, and further earlier rain during mature or harvesting period in the month of April-May restrict the expansion of onion production in the region during the winter season. Understanding how the onion plants grows and develops in a key part of developing a strategy to supply nutrients for optimum bulb yield and quantity. The phenology of onion have five major growth phase viz, germination, leaf growth, bulbing initiation, bulb growth and maturation. Onion have a universal long period at slow growth to the 3 leaf state. During this period, root growth also occurs at regular pace. Maturation commonly is evaluated by the percentage at tops down and by theamount at dry leaves present. Achieving a proper degree at maturation before harvest ia a key factor in producing high quality onions for storage. Hence, onion growth stage could be divided into three major stage viz, pre-bulbing (up to 45-80 days after planting) and thereafter bulb development and enlargement take place. New roots are produced from the bulb base plate as leaves develop above

ground in pre-bulbing period. The bulbing grown stage is considered to begin when bulb diameter reaches twice that at neck. Most onion varieties initiated bulb after 8 leaves have emerged. Leaves continue to emerge (12-14 true leaves) during bulbing and bulb growth onion eventually coincides with maximum nutrients demand. Integrated nutrients management provides betterand balanced environment, better food and living conditions to the human being, integrated nutrients management reduces the cost of production by utilization of organic waste or its products against chemical fertilizers, which are said to be potential source at pollution unless they are used in productive and efficient way. Integrated nutrient management supply approach for the crop by judicious mixture at organic manure and bio fertilizers along with the inorganic fertilizers has a number at agronomical and environmental advantages. Integrated Nutrients management (INM) is not only a reliable way to obtaining fairer high productivity with substantial fertilizers economy but a concept of ecological leading to sustainable to agriculture use of organic manureand fertilizers in conjunction with chemical fertilizers has been found to be promising not only in sustaining higher productivity but also providing stability in crop production in order to improve soil fertility for sustainable crop productivity of longterm basis also for reduction in fertilizers input cost, integrated nutrients management has become inevitable. Integrated nutrients management practices play an important role for good crop production. The continuous and in balanced use of inorganic fertilizers is adversely affecting the sustainability of agriculture production besides causing environmental pollution, integrated nutrients management provides excellent opportunities to overcome are the imbalance beside sustaining soild health and enhancing crop production.

MATERIALS AND METHODS

A field experiment was conducted during rabi 2023-2024 to study the "Effect of intergrated nutrient management on growth, yield and quality of onion *(Allium cepa L.)* cv. N-53". The details of material and methods used and the experimental techinque adopted during the course of investigation are described below. The experiment was laid out at the college farm Kulbhaskar Ashram Post Graduate College, Prayagraj (U.P.). The experiment was laid out in randomized block design with 3 replication and 11 treatment *i.e.* T1control, T2100% RDF (150:80:60 kg/ha.), T3 (100% Vermicompost @6 Tonnes), T4(100% Farmyard manure @24 Tonnes), T5(100% Vermicompost@ 6 Tonnes + Azospirillum), T6(50% Sulphur + 50% FYM), T7(50% Vermicompost + 50% FYM + Azospirillum), T8(25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum), T9(100% RDF + Azospirillum, T1050% RDF + 50% Vermicompost), T11(50% FYM + 50% Vermicompost). Total number of plots: 33, Row to Row distance 15 cm, Plantto Plant distance 30 cm, Net plot size 3 X 2.4.

The Present experiment was laid out in the field of vegetable research farm, Department of Horticulture, Kulbhaskar Ashram Post Graduate College Prayagraj (Allahabad) during rabi season 2023-24.

Prayagraj (Allahabad) is located between 24O47 N and 25ON latitudes and between 81O19 E and 82O21 E longtitudes. Prayagraj lies in the southern part of the state in gangetic plain and adjoining the Vindhyan plateau of india at an elevation of 98 meters.

The climate of Prayagraj is characterized by long and hot summer, a fairly pleasant monsoon and cold seasons. The winter usually extends from mid-November to February and is followed by the

summer which continues till about the middle of June. Rainy season lasts till the end of September.

The Rainfall in Prayagarj generally decrease from the South-East to North-West. About 88 percent of the annual rainfall is received during the monsoon season. July and August both the month contains maximum rainfall. The normal rainfall in prayagraj is 975.4 mm. average maximum and minimum temperature 42OC and 10OC respectively. The average annual relative humidity is 62%.

RESULTS AND DISCUSSION

Growth Parameters

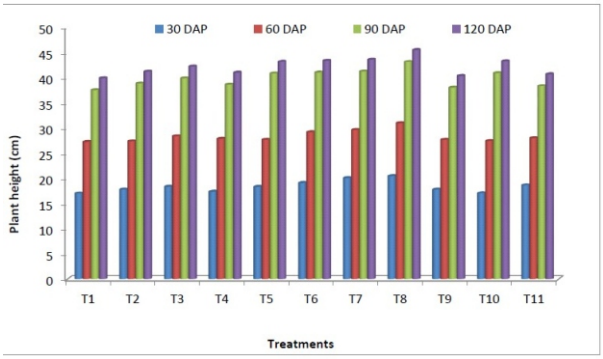
Height of the plant

At 30 DAT the treatments T8recorded maximum plant height (20.41cm) followed by T6(19.06 cm) and T7(19.99 cm) which are found at par. the minimum height (16.97 cm) was recorded under control (T1). Similarly T8noted maximum height (30.91 cm) of plant At 60 DATfollowed by T6(29.56 cm) and T7(29.14 cm) being at par. The lowest plant height was mentioned in T1 (27.21 cm). Similarly T8noted maximum height (43.11 cm) of plant At 90 DAT followed by T6 (41.99 cm) and T7(41.19 cm). The lowest plant height at 90 DAT was mentioned in T1 (37.50 cm).

The table envisage T8recorded first in plant height (45.47 cm) At 120 DAT while T6, T7and T10 noted height 43.55 cm, 43.35 cm, and 43.24 cm respectively and significantly at par. The T1recorded minimum height (39.86 cm). The height of plant at all successive stage (30, 60, 90, 120 DAT) was recorded maximum (20.41cm, 30.91 cm, 43.11 cm, 45.47 cm) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 1 : Effect of Intergrated Nutrient Management Treatments on Plant Height (cm.) of onion.

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	16.97	27.21	37.50	39.86
T_2	100% RDF (150:80:60 Kg/ha.)	17.73	27.32	38.81	41.177
T_3	100% Vermicompost @6 Tonnes	18.27	28.32	39.83	42.19
T_4	100% Farmyard Manure @ 24 TONNES	17.32	27.81	38.61	40.97
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	18.26	27.63	40.79	43.15
T_6	50% Sulphur + 50% FYM	19.06	29.14	40.99	43.35
T_7	50% Vermicompost + 50% FYM + Azospirillum	19.99	29.56	41.19	43.55
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	20.41	30.91	43.11	45.47
T_9	100% RDF + Azospirillum	17.72	27.63	37.97	40.33
T_{10}	50% RDF + 50% Vermicompost	17.01	27.40	40.88	43.24
T_{11}	50% FYM + 50% Vermicompost	18.59	27.95	38.30	40.66
F- test		S	S	S	S
S. Ed. (±)		0.380	0.413	0.449	0.544
SE(m)		0.269	0.292	0.318	0.385
C. D. (P = 0.05)		0.760	0.826	0.899	1.088



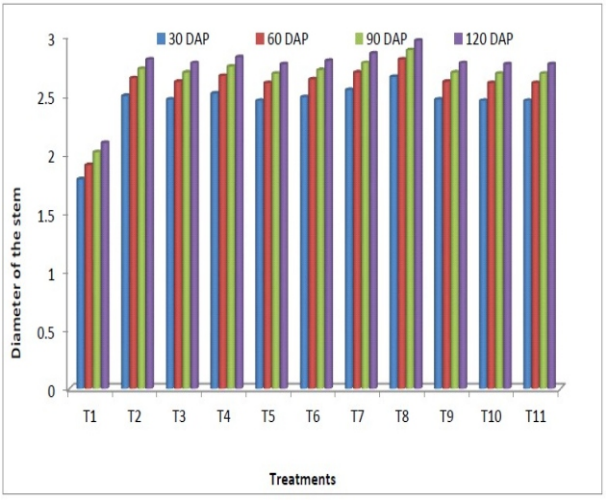
Diameter of stem

At 30 DATthe treatments T8recorded maximum diameter of stem (2.65cm) followed by T6(2.54 cm) and T7(2.48 cm)which are found at par. the minimum diameter of stem (1.78 cm) was recorded under control (T1). Similarly T8noted maximum diameter of stem (2.80 cm) of plant At 60 DAT followed by T6(2.69 cm) and T7(2.63 cm) being at par. The lowest diameter of stem was mentioned in T1 (1.90 cm). Similarly T8noted maximum diameter of stem (2.88 cm) At 90 DAT followed by T6 (2.77 cm) and T7(2.71 cm). The lowest diameter of stem at 90 DAT was mentioned in T1 (2.01 cm).

The table envisage T8recorded first in diameterof stem (2.96 cm)At 120 DAT while T6, T7and T10 noted diameter of stem 2.85 cm, 2.79 cm, and 2.76 cm respectively and significantly at par. The T1recorded minimum diameter of stem (2.09 cm). The diameter of stem at all successive stage (30, 60, 90, 120DAT) was recorded maximum (2.65 cm, 2.80 cm, 2.88 cm, 2.96 cm) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 2 : Effect of Intergrated Nutrient Management Treatments on diameter of stem (cm.) of onion.

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	1.78	1.90	2.01	2.09
T_2	100% RDF (150:80:60 Kg/ha.)	2.49	2.64	2.72	2.80
T_3	100% Vermicompost @6 Tonnes	2.46	2.61	2.69	2.77
T_4	100% Farmyard Manure @ 24 Tonnes	2.51	2.66	2.74	2.82
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	2.45	2.60	2.68	2.76
T_6	50% Sulphur + 50% FYM	2.54	2.69	2.77	2.85
T_7	50% Vermicompost + 50% FYM + Azospirillum	2.48	2.63	2.71	2.79
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	2.65	2.80	2.88	2.96
T_9	100% RDF + Azospirillum	2.46	2.61	2.69	2.77
T_{10}	50% RDF + 50% Vermicompost	2.45	2.60	2.68	2.76
T_{11}	50% FYM + 50% Vermicompost	2.45	2.60	2.68	2.76
F- test		S	S	S	S
S. Ed. (±)		0.092	0.078	0.089	0.092
SE(m)		0.065	0.055	0.063	0.065
C. D. (P = 0.05)		0.185	0.156	0.178	0.185



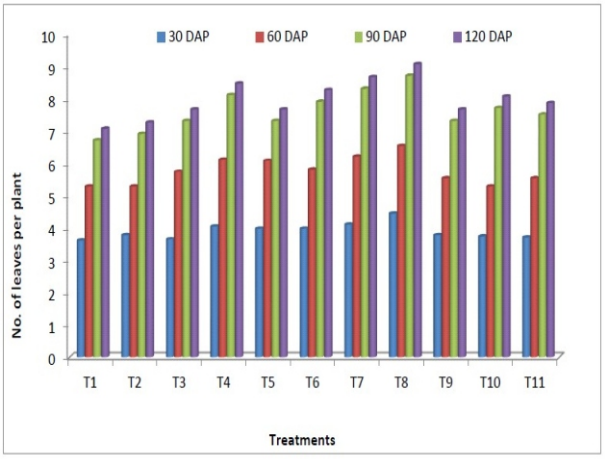
Number of leaves per plant

At 30 DATthe treatments T8recorded maximum number of leaves per plant (4.44) followed by T6(4.10) and T7(3.97) which are found at par. the minimum number of leaves per plant (3.60) was recorded under control (T1). Similarly T8noted maximum number of leaves per plant (6.53) At 60 DATfollowed by T6(6.20) and T7(5.80) being at par. The lowest number of leaves per plant was mentioned in T1 (5.27). Similarly T8noted maximum number of leaves per plant (2.88 cm) At 90 DATfollowed by T6 (2.77 cm) and T7(8.70). The lowest number of leaves per plant at 90 DAT was mentioned in T1 (6.70 cm).

The table envisage T8recorded first in number of leaves per plant (9.06) At 120 DATwhile T6, T7and T10 noted number of leaves per plant 8.66, 8.26, and 8.06 respectively and significantly at par. The T1recorded minimum number of leaves per plant (7.06). at all successive stage (30, 60, 90, 120 DAT) was recorded maximum (4.44, 6.53, 8.70, 9.06) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 3 : Effect of Intergrated Nutrient Management Treatments on number of leaves per plant (cm.) of onion.

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	3.60	5.27	6.70	7.06
T_2	100% RDF (150:80:60 Kg/ha.)	3.77	5.27	6.90	7.26
T_3	100% Vermicompost @6 Tonnes	3.64	5.73	7.30	7.66
T_4	100% Farmyard Manure @ 24 Tonnes	4.04	6.10	8.10	8.46
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	3.97	6.07	7.30	7.66
T_6	50% Sulphur + 50% FYM	4.10	6.20	7.90	8.26
T_7	50% Vermicompost + 50% FYM + Azospirillum	3.97	5.80	8.30	8.66
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	4.44	6.53	8.70	9.06
T_9	100% RDF + Azospirillum	3.77	5.53	7.30	7.66
T_{10}	50% RDF + 50% Vermicompost	3.73	5.27	7.70	8.06
T_{11}	50% FYM + 50% Vermicompost	3.70	5.53	7.50	7.86
F -		S	S	S	S
S. Ed.		0.096	0.366	0.380	0.362
S E		0.068	0.259	0.269	0.256
C. D. (P = 0.05)		0.192	0.733	0.760	0.724



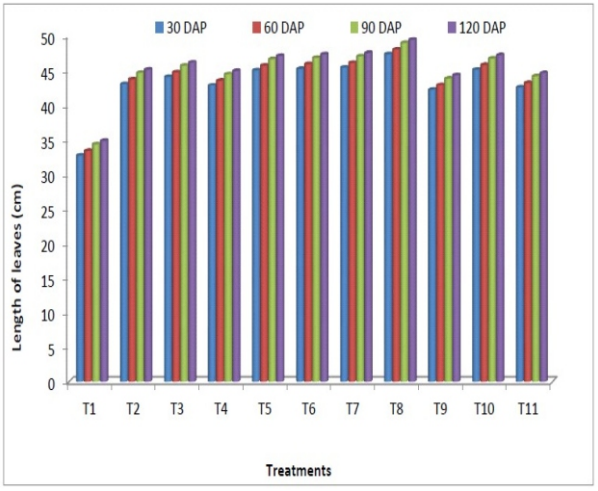
Length of leaves

At 30 DATthe treatments T8recorded maximum length of leaves (47.28cm) followed by T6(45.36 cm) and T7(45.16 cm) which are found at par. the minimum length of leaves (32.67 cm) was recorded under control (T1). Similarly T8noted maximum length of leaves (47.96 cm) at 60 DAT followed by T6(46.04 cm) and T7(45.84 cm) being at par. The lowest length of leaves was mentioned in T1 (33.32 cm). Similarly T8noted maximum length of leaves (48.90cm) at 90 DAT followed by T6 (46.98 cm) and T7(46.78 cm). The lowest length of leaves at 90 DAT was mentioned in T1 (34.29 cm).

The table envisage T8recorded first in length of leaves (49.38 cm) at 120 DAT while T6, T7and T10 noted length of leaves 47.46 cm, 47.26 cm, and 47.15 cm respectively and significantly at par. The T1recorded minimum length of leaves (34.77 cm). The length of leaves at all successive stage (30, 60, 90, 120 DAT) was recorded maximum (47.28 cm, 47.96 cm, 48.90 cm, 49.38 cm) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 4 : Effect of Intergrated Nutrient Management Treatments on length of leaves (cm.) of onion.

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	32.67	33.32	34.29	34.77
T_2	100% RDF (150:80:60 Kg/ha.)	42.98	43.66	44.60	45.08
T_3	100% Vermicompost @6 Tonnes	44.00	44.68	45.62	46.10
T_4	100% Farmyard Manure @ 24 Tonnes	42.78	43.46	44.40	44.88
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	44.96	45.64	46.58	47.06
T_6	50% Sulphur + 50% FYM	45.36	46.04	46.98	47.46
T_7	50% Vermicompost + 50% FYM + Azospirillum	45.16	46.84	46.78	47.26
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	47.28	47.96	48.90	49.38
T_9	100% RDF + Azospirillum	42.14	42.82	43.76	44.24
T_{10}	50% RDF + 50% Vermicompost	45.05	45.73	46.67	47.15
T_{11}	50% FYM + 50% Vermicompost	42.47	43.15	44.09	44.57
F- test		S	S	S	S
S. Ed. (±)		0.894	0.689	0.609	0.633
SE(m)		0.632	0.487	0.431	0.448
C. D. (P = 0.05)		1.788	1.378	1.218	1.267



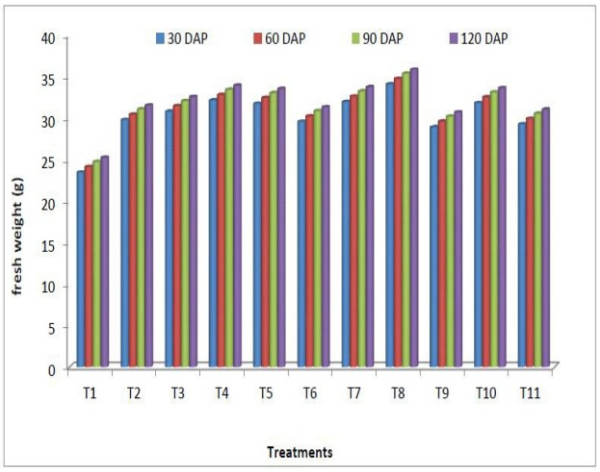
Fresh weight of leaves

At 30 DATthe treatments T8recorded maximum fresh weight of leaves (34.01 g.) followed by T6(31.89 g.) and T7(29.51 g.) which are found at par. the minimum fresh weight of leaves (23.40) was recorded under control (T1). Similarly T8noted maximum fresh weight of leaves (34.69 g.) at 60 DATfollowed by T6(32.57 g.) and T7(30.19 g.) being at par. The lowest fresh weight of leaves was mentioned in T1 (24.05 g.). Similarly T8noted maximum fresh weight of leaves (35.30 g.) at 90 DAT followed by T6 (33.80 g.) and T7(33.18 g.). The lowest fresh weight of leaves at 90 DATwas mentioned in T1 (24.69 g.).

The table envisage T8recorded first in fresh weight of leaves (35.79 g.) at 120 DATwhile T6, T7and T10 noted height 33.67 g., 31.29 g., and 30.98 g. respectively and significantly at par. The T1recorded minimum fresh weight of leaves (25.18 g.). The fresh weight of leaves at all successive stage (30, 60, 90, 120 DAT) was recorded maximum (34.01 g., 34.69 g., 35.30 g., 35.79) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 5 : Effect of Intergrated Nutrient Management Treatments on fresh weight of leaves (g.) of onion

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	23.40	24.05	24.69	25.18
T_2	100% RDF (150:80:60 Kg/ha.)	29.71	30.39	31.00	31.49
T_3	100% Vermicompost @6 Tonnes	30.73	31.41	32.02	32.51
T_4	100% Farmyaed Manure @ 24 Tonnes	32.09	32.77	33.38	33.87
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	31.69	32.37	32.98	33.47
T_6	50% Sulphur + 50% FYM	31.89	32.57	33.80	33.67
T_7	50% Vermicompost + 50% FYM + Azospirillum	29.51	30.19	33.18	31.29
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	34.01	34.69	35.30	35.79
T_9	100% RDF + Azospirillum	28.87	29.55	30.16	30.65
T_{10}	50% RDF + 50% Vermicompost	31.78	32.46	33.07	33.56
T_{11}	50% FYM + 50% Vermicompost	29.20	29.88	30.49	30.98
F- test		S	S	S	S
S. Ed. (±)		1.033	0.575	0.282	0.371
SE(m)		0.730	0.406	0.199	0.263
C. D. (P = 0.05)		2.065	1.150	0.564	0.743



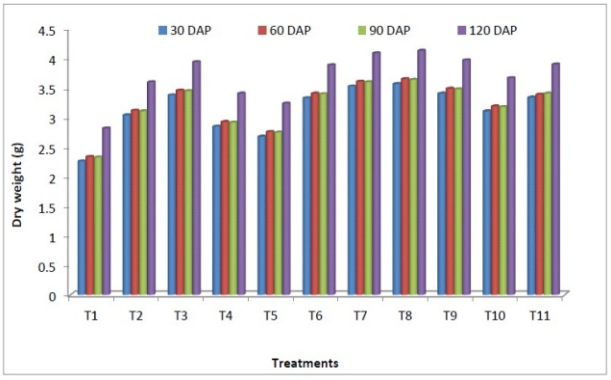
Dry weight of leaves

At 30 DAT the treatments T8recorded maximum dry weight of leaves (3.56 g.) followed by T6(3.52 g.) and T7(3.32 g.) which are found at par. the minimum dry weight of leaves (2.25) was recorded under control (T1). Similarly T8noted maximum dry weight of leaves (3.64 g.) at 60 DATfollowed by T6(3.60 g.) and T7(3.40 g.) being at par. The lowest dry weight of leaves was mentioned in T1 (2.33 g.). Similarly T8noted maximum dry weight of leaves (3.63 g.) at 90 DAT followed by T6 (3.59 g.) and T7(3.39 g.). The lowest dry weight of leaves at 90 DATwas mentioned in T1 (2.32 g.).

The table envisage T8recorded first in dry weight of leaves (4.12 g.) at 120DATwhile T6, T7and T10 noted height 4.08 g., 3.88 g., and 3.66 g. respectively and significantly at par. The T1recorded minimum dry weight of leaves (2.81 g.). The dry weight of leaves at all successive stage (30, 60, 90, 120 DAT) was recorded maximum (3.56 g., 3.64 g., 3.63 g., 4.12 g.) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 6 : Effect of Intergrated Nutrient Management Treatments on dry weight of leaves (g.) of onion

	Treatments	30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	2.25	2.33	2.32	2.81
T_2	100% RDF (150:80:60 Kg/ha.)	3.03	3.11	3.10	3.59
T_3	100% Vermicompost @6 Tonnes	3.37	3.45	3.44	3.93
T_4	100% Farmyard Manure @ 24 tonnes	2.84	2.92	2.91	3.40
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	2.67	2.75	2.74	3.23
T_6	50% Sulphur + 50% FYM	3.32	3.40	3.39	3.88
T_7	50% Vermicompost + 50% FYM + Azospirillum	3.52	3.60	3.59	4.08
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	3.56	3.64	3.63	4.12
T_9	100% RDF + Azospirillum	3.40	3.48	3.47	3.96
T_{10}	50% RDF + 50% Vermicompost	3.10	3.18	3.17	3.66
T_{11}	50% FYM + 50% Vermicompost	3.33	3.38	3.40	3.89
	F-test	S	S	S	S
	S.Ed. (+)	0.282	0.161	0.097	0.107
	SE(m)	0.199	0.114	0.069	0.076
	C.D. (P=0.05)	0.564	0.321	0.194	0.215

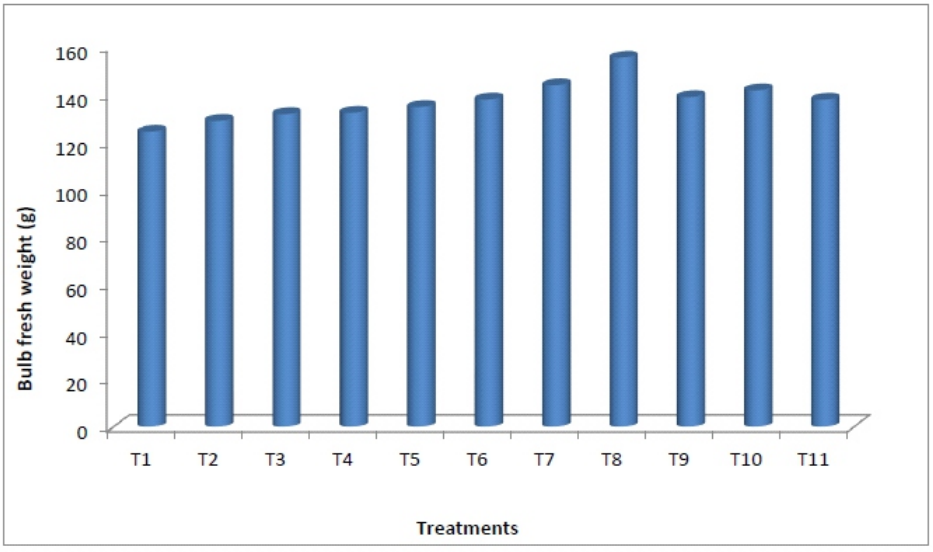


Fresh weight of bulb

The signifincantly maximum largest fresh weight of bulb (155.20) was recorded in treatment T8(25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF + Azospirillum) followed by (143.60) was recorded treatment T7(50% Vermicompost + 50% FYM + Azospirillum) and the minumum fresh weight bulb (123.98) was recorded in treatment T1.

Table No. - 7: Effect of Intergrated Nutrient Management Treatments on fresh bulb of yield (g.) of onion.

	Treatments Notation	Mean
T_1	CONTROL	123.98
T_2	100% RDF (150:80:60 Kg/ha.)	128.65
T_3	100% Vermicompost @6 TONNES	131.48
T_4	100% Farmyard Manure @ 24 TONNES	132.12
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	134.45
T_6	50% Sulphur + 50% FYM	137.60
T_7	50% Vermicompost + 50% FYM + Azospirillum	143.60
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	155.20
T_9	100% RDF + Azospirillum	138.70
T_{10}	50% RDF + 50% Vermicompost	141.51
T_{11}	50% FYM + 50% Vermicompost	137.51



F-test:-S

S.Ed.(+):-1.503

SE(m):-3.006

C.D. (5%):-3.006

Dry weight of bulb

The signifincantly maximum dry fresh weight (28.43) was recorded in treatment T8(25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF + Azospirillum) followed by (25.89) was recorded treatment T7(50% Vermicompost + 50% FYM + Azospirillum) and the minumum dry weight bulb (19.77) was recorded in treatment T1.

Table - 8 : Effect of Intergrated Nutrient Management Treatments on dry weight of bulb (g.) of onion.

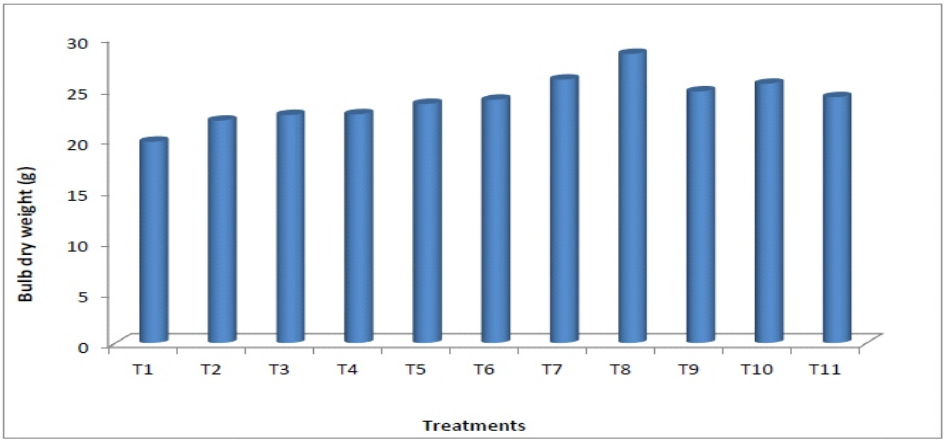
Treatments	Treatments Notation	Mean
T_1	CONTROL	19.77
T_2	100% RDF (150:80:60 Kg/ha.)	21.86
T_3	100% Vermicompost @6 Tonnes	22.42
T_4	100% Farmyard Manure @ 24 TONNES	22.50
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	23.50
T_6	50% Sulphur + 50% FYM	23.89
T_7	50% Vermicompost + 50% FYM + Azospirillum	25.89
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	28.43
T_9	100% RDF + Azospirillum	24.73
T_{10}	50% RDF + 50% Vermicompost	25.50
T_{11}	50% FYM + 50% Vermicompost	5.63

F- test:- S

S.Ed.(+):- 0.84

SE(m):- 0.596

C.D. (5%) 1



Yield Parameter

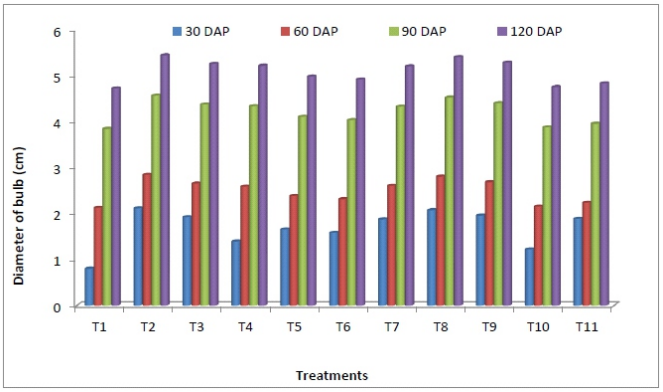
Size of bulb

At 30 DAT the treatments T8recorded maximum size of bulb (2.07 cm.) followed by T6(1.87 cm.) and T7(1.58 cm.) which are found at par. the minimum size of bulb (0.80 cm.) was recorded under control (T1). Similarly T8noted maximum size of bulb (2.80 cm.) at 60 DAT followed by T6(2.60 cm.) and T7(2.31.) being at par. The lowest size of bulb was mentioned in T1 (2.12 cm.). Similarly T8noted maximum size of bulb (4.52 cm.) at 90 DAT followed by T6 (4.32 cm.) and T7(4.03 cm.). The lowest size of bulb at 90 DAT was mentioned in T1 (3.84 cm.).

The table envisage T8recorded first in size of bulb (5.40 cm.) at 120 DAT while T6, T7and T10 noted height 5.20 cm., 4.91 cm., and 4.75 cm. respectively and significantly at par. The T1recorded minimum size of bulb (4.72 cm.). The size of bulb at all successive stage (30, 60, 90, 120 DAT) was recorded maximum (2.07 cm., 2.80 cm., 4.52 cm., 5.40 cm.) respectively under T8. Thus T8 showed superiority over other treatments at all successive stage.

Table - 9 : Effect of intergrated nutrient management treatments on size of bulb of onion.

Treatments		30 DAP	60 DAP	90 DAP	120 DAP
T_1	CONTROL	0.80	2.12	3.84	4.72
T_2	100% RDF (150:80:60 Kg/ha.)	2.11	2.84	4.56	5.44
T_3	100% Vermicompost @6 Tonnes	1.92	2.65	4.37	5.25
T_4	100% Farmyard Manure @ 24 Tonnes	1.39	2.58	4.33	5.21
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	1.65	2.38	4.10	4.98
T_6	50% Sulphur + 50% FYM	1.87	2.60	4.32	5.20
T_7	50% Vermicompost + 50% FYM + Azospirillum	1.58	2.31	4.03	4.91
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	2.07	2.80	4.52	5.40
T_9	100% RDF + Azospirillum	1.95	2.68	4.40	5.28
T_{10}	50% RDF + 50% Vermicompost	1.22	2.15	3.87	4.75
T_{11}	50% FYM + 50% Vermicompost	1.88	2.23	3.95	4.83
F- test		S	S	S	S
T_{10}	50% RDF + 50% Vermicompost	6.10		152.61	
T_{11}	50% FYM + 50% Vermicompost	6.23		158.44	
F- test		S		S	
S. Ed. (±)		0.273		1.701	
SE(m)		0.193		1.203	
C. D. (P = 0.05)		0.547		3.402	

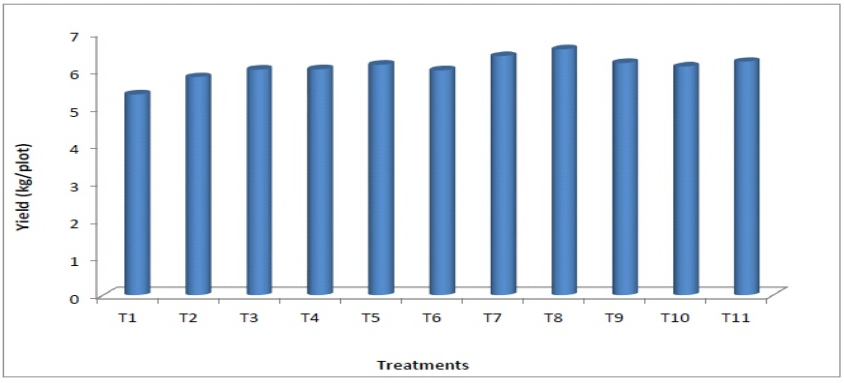


Yield per plot (kg) and yield quintal per hectare

At harvesting stage the treatment T8recorded maximum yield per plot (kg) and yield (q/ha) (6.56 kg and 164.11 q/ha) followed by T7. (6.38kg and 159.53 q/ha and The (6.56 kg and 164.11 q/ha) which are found at par. The minimum yield (5.36 kg and 134.09q/ha) was recorded under treatment T1.

The yield of onion at harvesting stage maximum (6.56 kg per plot and 164.11 q/ha) respectively under treatment T8. Thus T8showed superiority over other treatments at all successive stages.

Treatments		Yield (kg/plot)	Yield (q/h)
T_1	CONTROL	5.36	134.09
T_2	100% RDF (150:80:60 Kg/ha.)	5.82	145.73
T_3	100% Vermicompost @6 Tonnes	6.02	150.64
T_4	100% Farmyard Manure @ 24 Tonnes	6.03	150.81
T_5	100% Vermicompost @ 6 Tonnes + Azospirillum	6.15	153.96
T_6	50% Sulphur + 50% FYM	6.00	150.17
T_7	50% Vermicompost + 50% FYM + Azospirillum	6.38	159.53
T_8	25% Zinc + 25% Sulphur + 25% Vermicompost+ 25% RDF+ Azospirillum	6.56	164.11
T_9	100% RDF + Azospirillum	6.20	155.03
T_{10}	50% RDF + 50% Vermicompost	6.10	152.61
T_{11}	50% FYM + 50% Vermicompost	6.23	158.44
F- test		S	S
S. Ed. (±)		0.273	1.701
SE(m)		0.193	1.203
C. D. (P = 0.05)		0.547	3.402



CONCLUSION

Observation were recorded on different attributing characters of growth and yield. The growth was measured in term of plant height, diameter of stem, number of leaves per plant, length of leaves, fresh weight of leaves, dry weight of leaves, fresh weight of bulb and dry weight of bulb, size of bulb and yield of onion at different stages of growth. The bulb production attributes were studied harvest. The final yield was work out in q/ha on the basis of produce obtained in the net plot area.

The salient finding of scientific and

practical value emerging out of the study are embodied in this chapter. The significant results are briefly summarized as under.

1. Height of plant increase significantly with different treatment combination of intergrated nutrient management at 30,60,90 and 120 days after planting

2. The basal diameter of plant significantly increase at all stages of growth (30,60,90 and 120 DAT) with application of intergrated nutrient management.

3. The number of leaves per plant did not vary with different treatments.

4. Different leaves of treatments manufestue significant increase in length of leaves, fresh weight of leaves and dry weight of leaves at all stages of growth viz 30, 60, 90 and 120 days after transplanting.

5. Fresh weight and dry weight of bulb also significantly increase with various levels of treatments at all stages of growth.

6. The development of bulb measured in terms of diameter gave significant response to intergrated nutrient management at late stage of growth (120 DAT and Harvest stage).

7. The yield of onion was significantly enhanced with the application of intergrated nutrient management (T8-6.56 kg/plot and 164.11 q/ha).

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Journal of Natural Resource and Development 19 (2) 43-48, 2024 | NAAS RATING : 4.23 | ISSN-0974-5033

AN ECONOMIC ANALYSIS OF TOMATO CULTIVATORS IN AMBEDKAR NAGAR, UTTAR PRADESH, INDIA

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Received : 10.03.2024 Accepted : 25.05.2024

ABSTRACT

This study provides an economic analysis of tomato cultivation in Ambedkar Nagar, Uttar Pradesh, India. Tomatoes, a vital horticultural crop, are essential to both the Indian diet and agricultural economy. The analysis focuses on the cost structure associated with tomato farming, identifying key variable and fixed costsand evaluating their impact on the overall financial viability of the crop. The total cost of cultivation was found to be Rs. 125,673.50 per hectare, with variable costs, particularly machinery and human labour, constituting the largest share. The findings highlight the importance of effective resource management and cost optimization in enhancing the profitability of tomato farming. The study's results align with previous research, providing a robust framework for understanding the economic challenges and opportunities in tomato cultivation in the region.

Keywords: *Tomato cultivation, economic analysis, cost structure, variable costs, fixed costs, agricultural profitability etc.*

INTRODUCTION

The tomato is the edible berry of the plant Solanumly copersicum, commonly known as the tomato plant. Tamato originated in western South America and Central America. Tomatoes are a significant source of umami flavor. It is one of the most consumed vegetables in India. Due to its higher nutritional value and organic acid content. It is also a rich source of vitamin Cand it has a higher production rate and a highly ecological amplitude. It is not only consumed raw but also processed in ketchup, sauce, salad, chutney, picklesand soup. The tomato is known as the "poor man's orange" as it highly contains vitamin A and vitamin C. (Bassevine and Esengun, 2)

The tomato is one of the horticultural crops in the country. Horticulture products account for about 30 percent of the GDP among agricultural products. India is now in the first position in fruit productionand it is also the second-highest producer of vegetables in the

world, next only to the people of the Republic of China. Around 59 percent of the people of Uttar Pradesh live in rural areasand agriculture is the main occupation of the state. (Basyal*et al.,* 3)

Tomato cultivation holds a vital place in the agricultural economy of India, particularly in regions like Ambedkar Nagar, Uttar Pradesh, where a significant portion of the population is engaged in farming. The tomato, scientifically known as *Solanumlycopersicum*, is not just a staple in Indian cuisine but also a crucial cash crop for many farmers. Its origin traces back to western South America and Central Americaand over time, it has become one of the most widely cultivated vegetables worldwide due to its adaptability, nutritional benefitsand economic value.

In India, tomatoes are grown extensively due to their versatility and the country's favorable climatic conditions, which allow for year-round cultivation. The vegetable's high content of vitamins A and C, along with its rich organic acid profile, makes it an essential component of the Indian diet. Its consumption spans from raw intake to various processed forms like ketchup, sauces, salads, chutneys, picklesand soups, catering to diverse culinary needs.

Uttar Pradesh, a state with a predominantly rural population where agriculture is the primary livelihood, plays a significant role in India's tomato production. The state's contribution is crucial, given that horticulture products, including tomatoes, account for about 30 percent of the Gross Domestic Product (GDP) from agricultural products. India ranks first globally in fruit production and second in vegetable production, underscoring the importance of crops like tomatoes in its agricultural landscape.

Ambedkar Nagar, in particular, has emerged as a key area for tomato cultivation, with farmers increasingly relying on this crop for income generation. The region's agricultural practices, market dynamicsand socio-economic factors all contribute to the viability and success of tomato farming, making it an essential focus for economic analysis. Understanding the challenges and opportunities faced by tomato cultivators in this region can provide valuable insights into improving productivity, enhancing profitabilityand ensuring sustainable agricultural practices.

Table 1: Top ten-tomato producer in the world in 2021.

S.N.	Country	Production (In Tones)
1	China	67636725
2	India	21181000
3	Turkey	13095258
4	United States	10475265
5	Italy	6644790
6	Egypt	6245787
7	Spain	4754380
8	Mexico	4149241
9	Brazil	3679160
10	Nigeria	3575968

Source: Food and Agriculture Organization (F.A.O.)

In 2019, the world production of tomatoes was about 181 million metric tons, with China accounting for about 35 percent,

followed by India at about 11 percent of the total world production. In India, M.P. still holds the top position in tomato production, followed by Andhra Pradesh and Karnataka.

Table-2: Top ten tomato producer States in the India in year 2021-2022.

S.N.	State	Production (Tones)	Share (%)
1	Madhya Pradesh	2970	14.63
2	Andhra Pradesh	2217	10.92
3	Karnataka	2077	10.23
4	Tamilnadu	1489.03	7.34
5	Odisha	1432.29	7.06
6	Gujarat	1395	6.87
7	West Bengal	1284	6.33
8	Chhattisgarh	1149	5.66
9	Maharashtra	1125	5.54
10	Bihar	951	4.68

In Uttar Pradesh, Muzaffarnagar is the highest tomato-producing district, followed by Meerut, Ghaziabad, Bulandshahr, Aligarh, Badaun, Bareilly, Farrukhabad, Kannuaj, Auraiya, Unnao, Lucknow, Fatehpur, Prayagraj, Varanasi, Sonbhadraand, Jaunpur, respectively. The objectives have been set for the present study.

(i) To estimate the cost and the return structure of tomato cultivation.

(ii)To evaluate the constraints faced by the producer during the tomato cultivation.

MATERIALS AND METHODS

The study was based on methodological aspect of the research frame work has been choosen in conformity to the needs of the problem in respect the sampling method mode of data collection and tools of economic analysis. A multi stage stratified random sampling technique was used for the present study. The sampling unit at the respective stages were the block, the villages and the cultivators or tomato producer. Out of 9 development blocks in district Ambedkar Nagar was selected purposively on the basis of secondary information. For fulfil the objectives of the study both primary and secondary data was used. For the analysis of data tabular presentation was used to assess the cost, returns and profit of the tomato crop in the study area.

RESULTS AND DISCUSSION

The productivity and income from the vegetable production can be judged in a better way, if we analyze it with respect to the various costs in curred during the cultivation of particular vegetable crop the cost cultivation and cost of productions of any vegetable crop is the most important aspect of the farm economy both at micro and macro level point of views.

Input wise cost was worked out in two major heads namely variable cost and fixed cost. After the analysing the data it was revealed that the cost of cultivation was Rs.125673.46 per hectare in the study area. Average variable cost in the study was Rs. 99922.97 per hectare. In term of percentage it was 79.51 percent of the total cost. Human labour cost was major variable component in tomato cultivation

Table 3: Pattern of input used in tomato cultivation per hectare.

S.N.	Input used variable cost	Expenditure(Rs)	Percentage (%)
1	Seed	26655.34	21.21
2	Urea	1055.66	0.84
3	D.A.P.	2111.31	1.68
4	NPK	9375.24	7.46
5	Super phosphate	1017.96	0.81
6	Oil cake	754.04	0.60
7	Compost	728.91	0.58
8	FYM	226.21	0.18
9	Plant protection	3556.60	2.83
10	Irrigation	4737.90	3.78
11	Hired labour	5089.77	4.05
12	Family labour	16714.57	13.30
13	Machinery labour	26747.40	21.07
14	Interest on working capita 8%	1445.24	1.15
	Total variable cost	99922.97	79.51
	Fixed cost		
15	Land revenue	62.84	0.05
16	Rental Value of land	12316.00	9.83
17	Deprecation	1357.27	1.08
18	Interest on fixed capital 12%	552.96	0.44
	Total fixed cost	14326.77	11.40
	Managerial cost	11423.72	9.09
	Total cost	125673.50	100.00

wasRs. 21804.34 per hectare in the study area. Managerial cost calculated on a fixed cost component that was 9.09 percent in the study area. The economic analysis of tomato cultivation in Ambedkar Nagar, Uttar Pradesh, reveals significant insights into the cost structure and the financial viability of tomato farming in the region. The total cost of cultivation per hectare was calculated to be Rs. 125,673.46, which provides a comprehensive overview of the financial inputs required for successful tomato production.

The variable costs, which account for 79.51% of the total cost, play a critical role in determining the overall profitability of tomato farming. Among the various inputs, machinery labor emerged as the most substantial expense, constituting 21.07% of the total cost. This highlights the reliance on mechanization in tomato cultivation, which, while improving efficiency, also significantly adds to the cost burden on farmers. Human labor, both hired and family, also represents a major cost component, with a combined expenditure of Rs. 21,804.34 per hectare, which is 17.35% of the total cost. The high cost of labor reflects the labor-intensive nature of tomato farming, which requires significant manual input, especially during planting, harvestingand other critical stages of cultivation. Other notable variable costs include the expenditure on seeds, which accounted for 21.21% of the total costand fertilizers like NPK, which constituted 7.46%. The investment in quality seeds and fertilizers is essential for ensuring high yield and quality produce, justifying their significant share in the total cost. Fixed costs, including land revenue, rental value of land, depreciationand interest on fixed capital, constituted 11.40% of the total cost. The rental value of land was the most significant fixed cost, amounting to Rs. 12,316 per hectare, which indicates the importance of land availability and its associated costs in the overall economic framework of tomato cultivation. The managerial cost, calculated as 9.09% of the total cost, reflects the expenses associated with managing the farm operations, including decision-making, supervisionand overall farm management. This component is crucial as it underscores the importance of effective management practices in optimizing

production and reducing unnecessary costs. Results coincide with Al Saaed (1) and Kushwaha*et al.,*(4).

Table 4: Per hectare various cost concept used in tomato cultivation in study area.

Type of Cost	Cost in Rs per hectare
A_1	84631.61
A_2	84631.61
B_1	85182.42
B_2	97532.42
C_1	101898.62
C_2	114248.62
C_3	125673.50

The analysis also considered various cost concepts such as A1, A2, B1, B2, C1, C2and C3, with C3 representing the total cost of cultivation at Rs. 125,673.50 per hectare. The consistency of these results with previous studies by Verma*et al.* (6) and Singh (5) underscores the reliability of the findings and provides a strong basis for understanding the cost dynamics in tomato farming.

CONCLUSION

The economic analysis of tomato cultivation in Ambedkar Nagar, Uttar Pradesh, highlights the significant cost components and the financial viability of tomato farming in the region. The study reveals that the total cost of cultivation per hectare stands at Rs. 125,673.50, with variable costs comprising the majority (79.51%) of the total expenses. Among these, machinery labor and human labor are the most substantial contributors, indicating the reliance on mechanization and the labor-intensive nature of tomato farming. Fixed costs, including land rental and depreciation, make up 11.40% of the total costs, underscoring the importance of land resources and their associated expenses in the overall economic structure. Managerial costs account for 9.09% of the total expenditure, reflecting the critical role of effective farm management in optimizing production and profitability. The findings are consistent with previous studies and provide a reliable foundation for understanding the economic dynamics of tomato cultivation in the region. For farmers, this analysis offers valuable insights into cost management, resource allocationand potential areas for improving efficiency and profitability. By focusing on reducing variable costs and optimizing farm management practices, tomato cultivators in Ambedkar Nagar can enhance their income and ensure the sustainability of their farming operations.

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