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## Studies the effect of integrated crop management practices in turmeric for getting sustainable yield in Mydukur division of YSR Kadapa district

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### Abstract

Front line demonstration was conducted in 10 farmer fields at Settyvaripalli and T. Kothapalli villages of Mydukur Division of YSR Kadapa district during 2018-2021. Cultivation of Turmeric crop under raised bed system under drip irrigation and seed treatment with Mancozeb @ 0.3% for 40 min followed by seed treated with *Trichoderma viride* @ 0.5% for 30 min and basal application of liquid biofertilizers *Azospirillum* and Phosphorus solubilizing bacteria @ 1.25 lit per hectare each dissolved 20 lit water and mixed with 200 kg FYM and application of *Trichoderma viride* enriched FYM at 30 days after sowing is consider as T<sub>1</sub> and farmer practices T<sub>2</sub> (cultivation of Turmeric with RDF and foliar application of pesticide only). The practices of Integrated Crop Management in turmeric increases yield attributing characters viz., plant height, No. of tillers/ plant, No. of leaves/ plant and leaf length and breadth and Rhizome characters viz., No of rhizomes per clump (mother rhizomes, primary rhizomes and secondary rhizomes) and weight of rhizomes per clump (mother rhizomes, primary rhizomes and secondary rhizomes) were superior in ICM practice compare to farmers practice. The rhizome rot disease incidence 1.97 and 9.65%, leaf spot disease incidence was 29.33% and 32.4% and rhizome fly infestation was 0%, 0.24% in ICM practice (T<sub>1</sub>) and farmers practice (T<sub>2</sub>) respectively. Recorded 39.6 and 36.8 t/ha yield where as B:C ratio was 3.32:1 and 3.06:1 in ICM practice and farmers practice respectively.

**Keywords:** biofertilizers, ICM practices, Raised bed planting system, rhizome rot, rhizome fly

### 1. Introduction

Turmeric (*Curcuma longa* L.) is a major spice crop of India and is widely used as food colorant besides as a raw material in pharmaceutical and textile industries. The demand for turmeric is increasing due to its wide utility as a spice, natural dye, cosmetics and pharmaceuticals. It is valued for anticancerous, anti-inflammatory and antiseptic properties. India, being the world's largest producer of turmeric, gains importance for oleoresin and curcumin having medicinal value and ample export opportunity has been created by WTC (Selvan *et al.*, 1999) [9]. Curcumin the yellow colour pigment present in the rhizome is gaining importance with ban on artificial colours in food industry. It was used as digestive aid and treatment for fever, inflammation, wounds, infections, dysentery, arthritis, injuries, trauma, jaundice and other liver problems. In Unani, turmeric is considered to be the safest herb of choice for all blood disorders since it purifies, stimulates and builds blood.

In Andhra Pradesh turmeric crop is cultivated in an area of 23,498 ha which produces 1,66,326 tons. Due to various reasons the turmeric yields was a decrease drastically and farming was not remunerative, through follow improper management practices *i.e.* Cultivation of turmeric flat bed system and flooding method of irrigation results in stagnation of water in the field which leads to the incidence of rhizome rot disease which causes reduction of yields up to 14%, lack of awareness on seed treatment, utilize the Biofertilizers and bio-control agents (*Trichodrema viride*). In this connection a study was taken (front line demonstration) on Integrated crop management practices in Turmeric crop.

### 2. Materials and Methods

Field experiment was carried in farmer fields at Settyvaripalli and T.Kothapalli villages of Mydukur division of YSR Kadapa district and collected the soil sample for initial nutrient analysis. Application of liquid biofertilizers *Azospirillum* and PSB @ 1.25 lit each per hectare dissolved in 20 lit of water and uniformly mixed with 500 kg Farm yard manure and incubated

7 days in shade condition. Application of the Biofertilizers mixer as a basal along 75% RDF. Rhizome treated with Mancozeb @ 0.3% for 40 min followed by *Trichoderma viride* @ 0.5% for 30 min. Raised beds are formed help of bud farmer and treated rhizomes are sown in raised beds plating system. Multiplication of *Trichoderma viride* mixed with ratio of 90 kg FYM, 10 kg Neem Cake and 2 kg jaggery solution at 30 days after sowing. The yield attributing

characters viz., plant height, No. of tillers/ plant, No. of leaves/ plant and leaf length and breadth and Rhizome characters viz., No of rhizomes per clump (mother rhizomes, primary rhizomes and secondary rhizomes) and weight of rhizomes per clump (mother rhizomes, primary rhizomes and secondary rhizomes) pest and disease incidence was observed in farmer fields (both in ICM and non-ICM plots (T<sub>2</sub>- Farmer practices) in farmers fields at simultansiously).

**Table 1:** Treatments details.

T <sub>1</sub> (ICM Practice)	1. Cultivation in raised bed with drip irrigation 2. Rhizome treated with Mancozeb @ 0.3% for 40 min followed by <i>Trichoderma viride</i> @ 0.5% for 30 min. 3. Application of liquid Biofertilizers ( <i>Azospirillum</i> and PSB @ 1.25 lit each per hectare along 75% RDF. 4. Application of <i>Trichoderma viride</i> at 30 DAP.
T <sub>2</sub> (Non-ICM Farmer Practice)	1. Cultivation in flat bed with flood irrigation 2. Rhizomes are not treated with Mancozeb and <i>Trichoderma</i> 3. Application of 100% RDF (25 t/ha FYM manure, 500 kg Neem Cake/ Castor Cake, 25 kg ZnSo <sub>4</sub> , 375 kg SSP, 62.5 kg MOP at time of planting, 500 kg Neem Cake, 125 kg Urea, 62.5 kg MOP at 40, 80 DAP, 125 kg Urea, 62.5 kg MOP at 120 DAP). 4. Application of pesticide and insecticide based on need.

**3. Result and Discussion**

Effect of integrated crop management practices on plant growth characters, Rhizome characters and pest and disease incidence was examined in farmer fields (Multi-location trails) for assessing practices and detail discussion in given below.

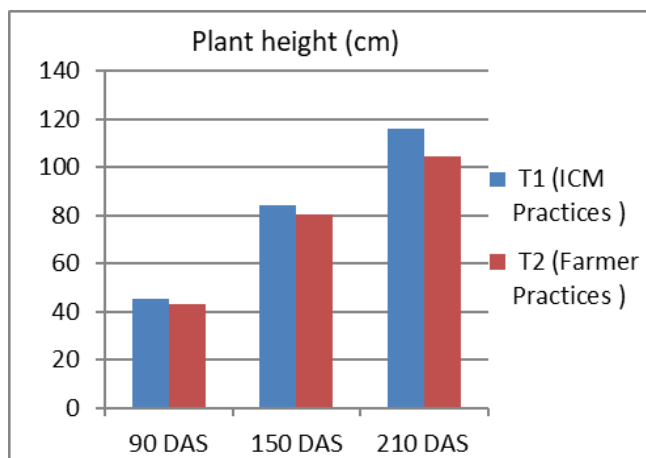
**3.1. Plant growth characters**

The plant growth parameters (plant height, No. of tillers / plant, No. of leaves / plant and Leaf length / breadth) was increases up to 210 DAS in T<sub>1</sub> (ICM practice- application of both organic and inorganic fertilizers along Biofertilizers) compare T<sub>2</sub> (Farmer practices - application inorganic fertilizer

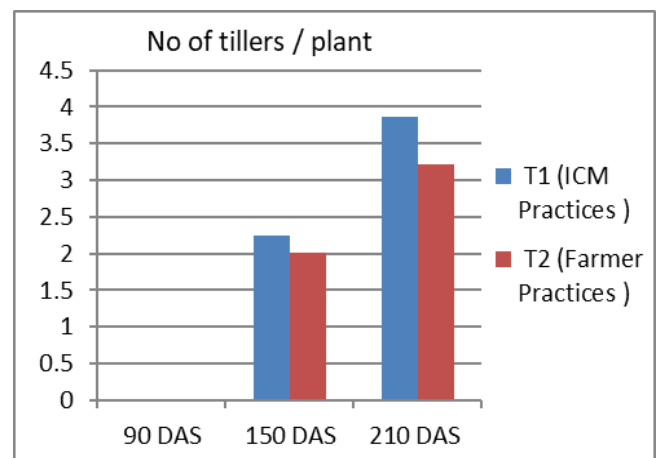
only). The plant growth increases due to synchronize of nutrients releases from both organic and inorganic sources according to plant nutrients requirements. The plant growth parameters increases at faster rate upto 210 days and thereafter slowed down. This trend was in good agreement with the observations of Manohar Rao *et al.*, (2005) [3] in turmeric. The slow growth after 210 days might be attributed to rhizomes development due to source and sink relationship. Transportation of more photosynthates from source (leaves) to sink (rhizomes). The number of leaves per tiller was significantly promoted with all the organic, inorganic and recommended dose of INM treatments (Singh, 2015) [7].

**Table 1:** Effect of Integrated Crop Management practices in plant growth characters at different stages in turmeric.

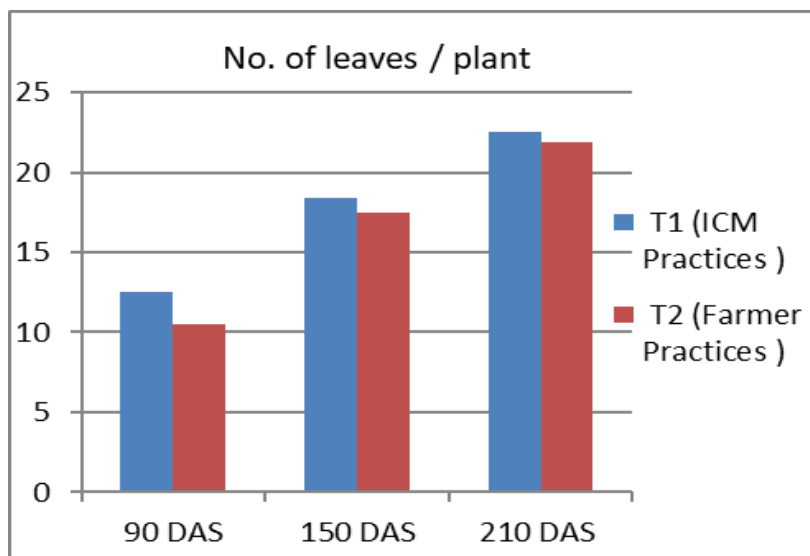
Plant characters	T <sub>1</sub> (ICM)	T <sub>2</sub> (FP)	T <sub>1</sub> (ICM)	T <sub>2</sub> (FP)	T <sub>1</sub> (ICM)	T <sub>2</sub> (FP)
	90 DAS	90 DAS	150 DAS	150 DAS	210 DAS	210 DAS
Plant height (cm)	45.54	43.12	84.25	80.32	115.65	104.32
No. of tillers / plant	0	0	2.25	2.02	3.86	3.21
No. of leaves / plant	12.49	10.47	18.36	17.44	22.50	21.92
LAI (Leaf length / breadth) cm	24/10.2	20/8.3	59.2/13.2	51.2/15.1	84.3/19.5	80.3/17.4



**Fig 1:** Effect of ICM practices in plant height



**Fig 2:** Effect of ICM practices in No of tillers / plant



**Fig 3:** Effect of ICM practices in No. of leaves / plant

### 3.2. Rhizome characters

Rhizome characters (Table 2) viz., No of rhizomes per clump (mother rhizomes, primary rhizomes and secondary rhizomes) and weight of rhizomes per clump (mother rhizomes, primary rhizomes and secondary rhizomes) were superior in T<sub>1</sub> (ICM practice) compare to T<sub>2</sub> (farmers practice). The vigorous growth of crop observed through maximum plant height, number of leaves per plant, number of tillers per clump and LAI might be attributed to higher rhizome yield in T<sub>1</sub>. The

yield and quality of turmeric with application of Biofertilizers along with organic manures appears to enhance microbial activities in the soil and improved nutritional status in the root zone as well as in the plant system. The number of tillers is an important yield attribute in turmeric; it would influence the yield in turmeric as reported by Balkrishnamurthy *et al.*, (2009) [1] in turmeric. The results of Singh *et al.*, (2009) [8] in ginger and Singh (2013) in turmeric are also in confirmation with the present results.

**Table 2:** Effect of Integrated Crop Management practices on Rhizome characters

Rhizome characters	Number of Rhizomes per clump			Weight of Rhizomes per clump (gm)		
	Mother rhizomes	Primary rhizomes	Secondary rhizomes	Mother rhizomes	Primary rhizomes	Secondary rhizomes
T <sub>1</sub> (ICM practice)	3.13	9.37	3.00	121.58	171.67	25.67
T <sub>2</sub> (Farmers Practice)	2.98	8.40	2.54	104.55	154.84	19.56

### 3.3. Pest and disease incidence

Rhizome rot disease incidence 1.97 and 9.65%, leaf spot disease incidence was 29.33% and 32.4% and rhizome fly infestation was 0%, 0.24% in T<sub>1</sub> (ICM practice) and T<sub>2</sub> farmers practice respectively. Seed treatment with Mancozeb @ 0.3% for 40 min followed by seed treated with *Trichoderma viride* @ 0.5% for 30 mi and application of *Trichoderma viride* enriched FYM at 30 days after sowing in

T<sub>1</sub> (ICM practices) reduces the primary and secondary inocula of pathogen present in seed and soil. The application of fungicide may also inhibit the growth of fungi. Similar result was reported by Rahman 2011. Kamal Hosain *et al.*, (2018) [2] reported that the treatment of seed rhizomes with mancozeb 0.3 percent for 30 minutes before storage and once again before planting reduces the incidence of disease.

**Table 3:** Effect of Integrated Crop Management practices on Pest and disease incidence

Pests and diseases	Percent of infestation (or) infection	
	T <sub>1</sub> (ICM Practice)	T <sub>2</sub> (Farmers practice)
Rhizome rot disease	1.97%	9.65%
Leaf spot disease	29.33%	32.4%
Rhizome fly	0%	0.24%

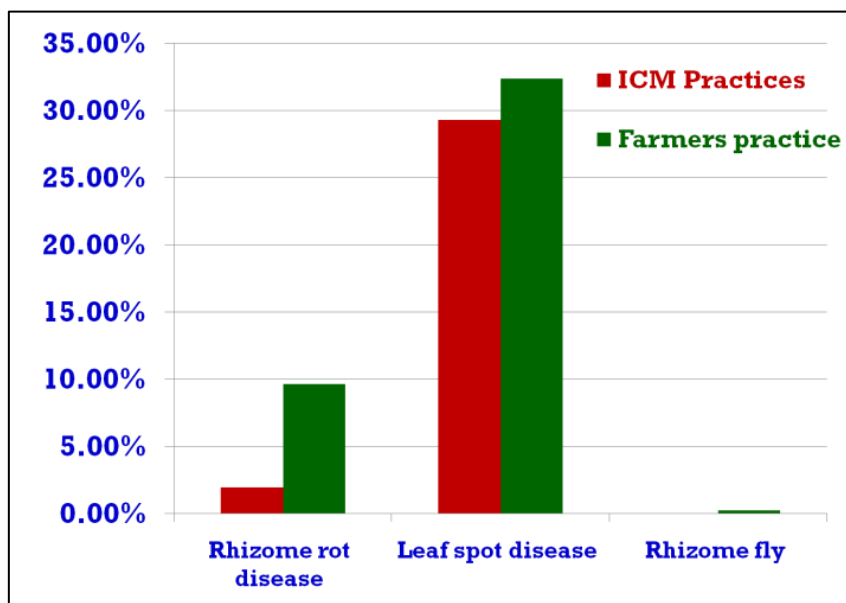


Fig 4: Effect of ICM practices on Pest and disease incidence

### 3.4. Yield and economics

Yield and economics of turmeric cultivation was influenced by ICM practices ( $T_1$ ) compare farmer practices ( $T_2$ ). The data revealed that increased in yield gross returns, net return and B:C progressively in  $T_1$  (ICM practice) compare to  $T_2$  (farmer practice). Yield in 104.5 and 92.2 kg/5x5m<sup>2</sup>, 39.6 and 36.8 t/ha, B:C ratio was 3.32:1 and 3.06:1 in ICM practice

and farmers practice respectively. The cost of cultivation was reduces due to reduces the use of inputs (cost on purchasing of Fertilizer, pesticide and insecticides) for cultivation of turmeric. Follow the ICM practices in  $T_1$  increases the gross income through increases the rhizome yield and reduces the cost of cultivation increases the net income and B:C for cultivation of turmeric crop.

Table 4: Yield and economics of Integrated Crop Management practices.

Technology	Yield (Kg / 5X5 m <sup>2</sup> )	Yield (t/ha)	Cost of cultivation (Rs/ ha)	Gross returns (Rs/ ha)	Net returns (Rs/ ha)	B:C Ratio
$T_1$ (ICM practice)	104.5	39.6	1,74,500	5,80,800	4,06,300	3.32:1
$T_2$ (Farmers practice)	92.2	36.8	1,76,000	5,39,734	3,63,734	3.06:1

### Conclusion

Integrated Crop Management Practices in turmeric cultivation crop under raised bed system with drip irrigation and seed treatment with Mancozeb @ 0.3% for 40 min followed by seed treated with *Trichoderma viride* @ 0.5% for 30 min and basal application of liquid Biofertilizers *i.e* *Azospirillum* and Phosphorus solubilizing bacteria @ 1.25 lit per hectare each dissolved 20 lit water and mixed with 200 kg FYM and application of *Trichoderma viride* enriched FYM at 30 days after sowing. The practices of Integrated Crop Management ( $T_1$ ) in turmeric increases yield attributing characters and Rhizome characters compare to farmers practice ( $T_2$ ). The rhizome rot disease incidence 1.97 and 9.65%, leaf spot disease incidence was 29.33% and 32.4% and rhizome fly infestation was 0%, 0.24% in ICM practice and farmers practice respectively. Recorded 39.6 and 36.8 t/ha yield where as B:C ratio was 3.32:1 and 3.06:1 in ICM practice ( $T_1$ ) and farmers practice ( $T_2$ ) respectively.

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