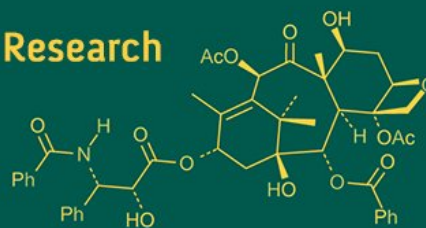


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Sowmya M

Ph.D. Scholar, Department of
Plantation, Spices, Medicinal
and Aromatic Crops, Dr.
YSRHU, College of
Horticulture,
Anantharajupeta, Andhra
Pradesh, India

Yuvaraj KM

Principal Scientist,
Department of Horticulture,
HRS, Anantharajupeta,
Andhra Pradesh, India

Lalitha Kadiri

Senior Scientist, Department
of Agronomy, Dr. YSRHU,
Banana Research Station,
Pulivendula, Andhra Pradesh,
India

Sreedhar D

Principal Scientist,
Department of Horticulture,
Dr. YSRHU, HRS,
Madanapalle, Andhra Pradesh,
India

Corresponding Author:**Sowmya M**

Ph.D. Scholar, Department of
Plantation, Spices, Medicinal
and Aromatic Crops, Dr.
YSRHU, College of
Horticulture,
Anantharajupeta, Andhra
Pradesh, India

Influence of drip fertigation and mulching on productivity and economics of turmeric cv. Pragati

Sowmya M, Yuvaraj KM, Lalitha Kadiri and Sreedhar D

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Abstract

A field experiment was conducted during 2024 -25 at Dr. YSRHU–College of Horticulture, Anantharajupeta, Andhra Pradesh, India to evaluate the effect of fertigation and mulching on the yield and economics of turmeric (*Curcuma longa* L.) cv. Pragati. The experiment was conducted in split-plot design with five main plot and three subplot treatments replicated thrice. Fertigation, mulching and their interaction significantly influenced turmeric productivity and economic returns. The highest rhizome yield (29.85 t ha⁻¹), gross returns (₹10,44,750 ha⁻¹) and net returns (₹8,44,534 ha⁻¹) were recorded with F3M3 (100% RDF through drip fertigation + organic mulch), while the maximum B:C ratio (5.25) was observed in F4M3 (75% RDF through drip fertigation + organic mulch). The lowest yield and economic returns were obtained in F5M1 and the lowest B:C ratio was recorded in F1M1. The results indicated that integration of organic mulch with drip fertigation, particularly 100% RDF through drip fertigation, enhanced turmeric yield while profitability in terms of B:C ratio was maximum in F4M3 (75% RDF through drip fertigation + organic mulch, which may be recommended as an economically viable production practice under the agro-climatic conditions of southern Andhra Pradesh.

Keywords: Turmeric, drip fertigation, organic mulch, rhizome yield and profitability

Introduction

Turmeric (*Curcuma longa* L.), a perennial rhizomatous spice crop belonging to the family Zingiberaceae, is believed to have originated in Southeast Asia. It is a sterile triploid species (2n = 3x = 63) propagated through underground rhizomes and is popularly known as the "golden spice" owing to its culinary, medicinal, cosmetic and industrial importance. The rhizomes are widely used in traditional Indian systems of medicine (Ayurveda, Unani and Siddha), primarily due to the presence of curcumin (diferuloylmethane), which possesses antioxidant, anti-inflammatory, antimicrobial, antiviral, hypoglycaemic and anticancer properties (Julie, 2009). India is the world's largest producer, consumer and exporter of turmeric, contributing nearly 80% of global production (Chitdeshwari, 2019) ^[1].

As a long-duration and nutrient-exhaustive crop, turmeric requires an adequate and continuous supply of water and nutrients to achieve optimum growth, yield, and quality (Syed *et al.*, 2010) ^[8]. Although split application of fertilizers has been recommended to improve nutrient use efficiency (Jagadeeswaran *et al.*, 2004) ^[2], drip fertigation offers a more precise and efficient method of delivering water and nutrients directly to the root zone. Similarly, mulching conserves soil moisture, regulates soil temperature, suppresses weeds and improves the soil environment. The integration of drip fertigation and mulching has been reported to enhance rhizome yield, nutrient and water use efficiencies, quality and economic returns, as reflected by higher benefit (B:C) ratios compared with conventional cultivation practices (Thiyagarajan *et al.*, 2011; Kandianan and Chandaragiri, 2008) ^[3, 10]. Therefore, the present study was undertaken to evaluate the effect of different fertigation levels and mulching practices on the economic profitability of turmeric.

Material and Methods

The field experiment was conducted during the 2024 - 25 growing season (July 2024 to January 2025). at Dr. YSRHU–College of Horticulture, Anantharajupeta, Andhra Pradesh, India (13.98° N, 79.40° E), located in the Southern Agro-Climatic Zone of Andhra Pradesh. The study comprised 15 treatment combinations arranged in a split-plot design with three

Replications to evaluate the effect of fertigation and mulching on the yield and economics of turmeric (*Curcuma longa* L.) cv. Pragati. The main plot treatments consisted of five fertigation treatments: F₁ – flood irrigation + 100% RDF through soil application, F₂ – drip irrigation + 100% RDF through soil application, F₃ – drip fertigation + 100% RDF, F₄ – drip fertigation + 75% RDF and F₅ – drip fertigation + 50% RDF. The sub-plot treatments comprised M₁ – no mulch, M₂ – silver-black polyethylene mulch and M₃ – organic mulch. Cost of cultivation was calculated on a hectare basis using prevailing input and labour costs.

Results and Discussions

The economics of turmeric cultivation was significantly influenced by fertigation, mulching and their interaction (Table 1). The cost of cultivation ranged from ₹1,72,666 ha⁻¹ to ₹2,01,716 ha⁻¹, with the highest cost recorded in

F3M2 (₹2,01,716 ha⁻¹), followed by F3M3 (₹2,00,216 ha⁻¹), whereas the lowest cost was observed in F5M1 (₹1,72,666 ha⁻¹). Rhizome yield varied from 20.51 to 29.85 t ha⁻¹, with the highest yield recorded in F3M3 (29.85 t ha⁻¹), followed by F3M2 (29.06 t ha⁻¹) and F4M3 (28.55 t ha⁻¹), while the lowest yield was obtained in F5M1 (20.51 t ha⁻¹). Corresponding to the higher yield, F3M3 recorded the maximum gross returns (₹10,44,750 ha⁻¹) and net returns (₹8,44,534 ha⁻¹), followed by F3M2 (₹10,17,100 and ₹8,15,384 ha⁻¹, respectively) and F4M3 (₹9,99,250 and ₹8,08,810 ha⁻¹, respectively). The lowest gross returns (₹7,17,850 ha⁻¹) and net returns (₹5,45,184 ha⁻¹) were recorded in F5M1. The B ratio ranged from 4.00 to 5.25, with the highest value recorded in F4M3 (5.25), followed closely by F3M3 (5.22) and F3M2/F4M2 (5.04), whereas the lowest B: C ratio was recorded in F1M1 (4.00).

Table 1: Effect of Different Treatments on Cost of Cultivation, Turmeric Yield, Gross Returns, Net Returns and Benefit–Cost Ratio

S. No	Treatment	Total cost of cultivation	Turmeric yield (ton ha ⁻¹)	Gross returns (₹ ha ⁻¹)	Net returns (₹ ha ⁻¹)	B: C Ratio
1	M ₁ S ₁	1,83,833	21.01	735350	5,51,517	4.00
2	M ₂ S ₁	1,93,333	25.44	890400	6,97,067	4.61
3	M ₃ S ₁	1,91,833	25.94	907900	7,16,067	4.73
4	M ₁ S ₂	1,83,833	22.87	800450	6,16,617	4.35
5	M ₂ S ₂	1,93,333	26.60	931000	7,37,667	4.82
6	M ₃ S ₂	1,91,833	27.09	948150	7,56,317	4.94
7	M ₁ S ₃	1,92,216	23.88	835800	6,43,584	4.35
8	M ₂ S ₃	2,01,716	29.06	1017100	8,15,384	5.04
9	M ₃ S ₃	2,00,216	29.85	1044750	8,44,534	5.22
10	M ₁ S ₄	1,82,440	23.25	813750	6,31,310	4.46
11	M ₂ S ₄	1,91,940	27.66	968100	7,76,160	5.04
12	M ₃ S ₄	1,90,440	28.55	999250	8,08,810	5.25
13	M ₁ S ₅	1,72,666	20.51	717850	5,45,184	4.16
14	M ₂ S ₅	1,82,166	24.30	850500	6,68,334	4.67
15	M ₃ S ₅	1,80,666	24.91	871850	6,91,184	4.83

Among all the treatments, M3F3 (organic mulch + 100% RDF through drip fertigation) proved to be the most productive and profitable treatment, recording the highest rhizome yield, gross returns and net returns. The treatment also exhibited a high B: C ratio (5.22), indicating excellent economic viability. Although the maximum B: C ratio was recorded in M3F4 (5.25), the difference from M3F3 was marginal and may be attributed to the lower fertilizer input cost in M3F4. Hence, M3F3 can be considered the most suitable treatment for achieving higher turmeric productivity and profitability under the present experimental conditions.

Discussion

The improved economic performance observed under drip-fertigated and mulched treatments may be attributed to efficient water and nutrient management, which enhanced turmeric productivity and profitability. Organic mulching likely conserved soil moisture, reduced evaporation losses and improved soil conditions, thereby promoting better crop growth and economic return. The beneficial effect of mulching on turmeric economics observed in the present study was in agreement with manhas *et al.* (2011) [5], who reported higher yield and profitability under mulched conditions than under non-mulched treatments. Similarly, the enhanced economic returns recorded under drip fertigation were consistent with the findings of Santosh *et al.* (2022) [7], who reported greater profitability in turmeric under drip irrigation combined with mulching.

The higher economic efficiency obtained under the reduced fertigation level suggested that moderate fertilizer input was sufficient to sustain productivity while lowering cultivation cost. In contrast, conventional irrigation without mulch and reduced fertilizer input under non-mulched conditions resulted in lower productivity and profitability. Overall, the findings demonstrated the economic advantage of integrating organic mulch with drip fertigation for sustainable turmeric cultivation under the present experimental conditions.

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