

RESEARCH ARTICLE :

Front line demonstration on improved cultivation practices in tomato (Trellising, drip irrigation and mulching)

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SUMMARY : Front-line demonstrations on improved cultivation practices in tomato were conducted under the close supervision of scientists of the Krishi Vigyan Kendra, Adilabad district. Front-line demonstrations (FLDs) are the technologies demonstrated for the first time by the scientists themselves before being fed into the main extension system of the State Department of Agriculture. Front-Line Demonstrations are conducted under the close supervision of the scientists of the National Agriculture Research System comprising of ICAR Institute, National Research Centres, Project Directorates, Krishi Vigyan Kendras and the State Agricultural Universities and its regional Research Stations. This FLD conducted for two years during *Kharif to Rabi* 2012 and *Kharif to Rabi* 2013 at 10 locations from four villages. The comparison was made between farmers regular practice (Furrow method of irrigation, not following trellising and mulching) and improved practice (Trellising, Plastic mulching, Drip irrigation). This production system keeps plants growing upright and off the ground. Most growers who have tried it are convinced the fruit quality is better (bigger fruit, less rots, easier to pick). In *Kharif*, 2013 average yield obtained in demo is 1019 q/ha, in farmers practice 438 q/ha. The percentage increase in demo yield is 133 per cent over farmers practice. The benefit cost ratio is also high in demo is 3.07, low in check is 1.4. In *Kharif*, 2012 demo yield is almost double *i.e.*, 880 q/ha with compare to farmers practice is 430 q/ha. In demo plot the yield, fruit size improved. Quality of fruits improved by complete controlling of fruit rot disease attack.

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BACKGROUND AND OBJECTIVES

Tomato (*Solanum lycopersicum* L.) is one of the most important vegetable plants in the world. It originated in western South America, and domestication is thought to have occurred in Central America. By adopting

trellising, mulching methods increases net profits due to increased cropping period. Trellising method keeps the fruit off the ground and allows good air movement around the plants.

The trial is conducted in Adilabad district lied in northern telangana zone, comprising the

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districts of Adilabad, Nizamabad, Karimnagar. The annual normal rainfall of the zone is around 945-1230mm. Adilabad district situated between 77° 46' and 80° 01' of the eastern longitude and 18° 40' and 19° 56' of northern latitudes. The altitude is around 2000 meters above Mean Sea Level. It is bounded on north, east and west by Maharashtra state and on south by Nizamabad and Karimnagar districts of Telangana state. The most important river that flows in the district is the Godavari, which forms the southern boundary of the district. The other rivers include the Penganga, the Wardha and the Pranahita. The Kaddam and the Peddavagu are tributaries of the Godavari, maintains the advantages of having the right soils, climate, and moisture to produce the highest quality tomatoes. The rainfall recorded in June, 2013 is 344.3 mm which is 72 per cent more than normal rainfall *i.e.*, 200.0. Rain fall recorded in the month of July, 2013 is 1056.8mm which is 89 per cent more than normal rain fall *i.e.*, 558.4 (Annual Reports, 2012 and 2013). Due to high rainfall fruit rot of tomato is major problem among tomato growers. The major vegetable crops grown in the district are tomato, chilli, okra, beans, cowpea and leafy vegetables. Area under drip irrigation increasing day by day. Krishi Vigyan Kendra is a farm science centre found in district head quarters working under Professor Jayashankar Telangana State Agricultural University.

Three types of soils found in the district *i.e.*, black soils, red soils, sandy soils. The majority of soils in the district is Black Cotton Soils have high water holding capacity, occupies an area of 1,12,531 ha. Red soils occupies an area of 2,1,100 ha have characteristic of crust formation. Sandy soils occupies very less area of 7,033 ha, characterised by low water holding capacity, loss of nutrients (KVK Adilabad annual report, 2012, 2013). Krishi Vigyan Kendra adopted nine backward villages within a radius of 60 km from district head quarters. The main concept for village adoption is improving the farmer's knowledge by giving training programmes, conducting Front Line Demonstrations (FLDs), On Farm Trials (OFTs) and method demonstrations there by increasing farmers income. Krishi Vigyan Kendra reaches farmers of entire district, but mainly concentrated on adopted villages. In adopted villages tomato is one of the main vegetable crop grown by smallholder farmers in *Kharif* season. Soil types of adopted villages is black cotton soils hold rain water in

Kharif results water logging due to heavy rains. Tomato fruits touch ground surface and rotten in such conditions. This is the major problem phasing by tomato growers. During village surveys conducted by KVK scientists this problem is identified. To control these KVK scientists planned trellising method in tomato. Despite any trellising method used, training reduces the yield of unmarketable fruits (Chandiposha *et al.*, 2015). Due to heavy water holding capacity of soils heavy weed growth occurs in fields. To control weeds and water logging we recommended plastic mulching and drip irrigation. By combining all these three solutions we planned a Front Line Demonstration (FLD) on improved cultivation practices in tomato *i.e.*, trellising method, plastic mulching and drip irrigation, bed system of cultivation.

RESOURCES AND METHODS

The KVK, Adilabad adopted 9 tribal, backward villages based on the concept of improving farmers practical knowledge in cultivation of various crops, and increasing the net returns. Most of the farmers in adopted villages are tribal, very innocent, and illiterate. They don't know about pest control, good varieties, and improved cultivation practices. During KVK village surveys scientists went to adopted villages, interacted directly with farmers in their villages. Visited their fields and data collected on difficulties phased by tribal farmers in farming. Tomato crop mainly grown in Gourapur, Pataguda, Ambugaon, Pittabongaram villages adopted by KVK. In tomato cultivation farmers told three main problems *i.e.*, 1. fruit rot disease, 2. severe weed infestation, 3. water logging in *Kharif* season due to heavy rainfall. To control fruit rot selected trellising method, to control weed infestation used plastic mulch sheet, to control water logging of heavy black cotton soils planned drip irrigation instead of flood irrigation method. By combining all these three methods KVK planned a Front Line Demonstration on Improved cultivation practices in tomato *i.e.*, trellising method, mulching, and drip irrigation. These three are proven technologies by various research stations in India and world. We took these technologies from Sri Konda Laxman Horticultural University.

Conducted this demonstration in ten farmer's fields. There are only two treatments in lied in any FLD. Those are T₁ (Farmers practice), T₂ (Demo). Here T₁ : Non adoption of trellising method, drip irrigation, plastic

Mulching, T₂: Adoption of trellising method, drip irrigation, Plastic mulching. In one acre of tomato field conducted FLD in half acre, remaining half acre grown by farmer's regular practice. In demo plot raised beds prepared with farm machinery, Recommended dose of manure and fertilizer applied during last ploughing. Width of the bed is 1mt, gap between two beds is 30 cm is convenient for moving to conduct various operations like sprayings, pickings etc. Drip laterals spread on beds beneath the mulch sheet. Plastic mulch sheet spread on beds and soil kept on mulch sheet boarders. On plastic sheet, holes made with a spacing of 60x60 cm². 25 days old tomato nursery transplanted in holes of plastic mulch sheet. 15 days after transplanting started trellising method. First collected 8 feet length, 5 inch width strong wooden poles 500 no per half acre. Done marking on the tomato growing beds with a distance of 1.8 meter (6 feet). One side wooden poles dipped in coal tar and sundried to protect from termites damage. These are placed coal tar side in holes and fitted on bed. Total three rows of supporting wire at three various distances on poles connected by tying. First row plastic wire connected by tying all poles on each bed on 20 cm height from ground level. Small braches tied to this plastic wire. Second row 60 cm height from ground level, connected poles with GI wire by tying.



Fig. A : Trial field photograph taken at Gourapur village in the year-2012

Medium size branches tied to second row. Third row 1.5 meter height from ground level, connected poles with GI wire. Long branches tied to third row. Jute thread used for tying of branches to wire. Finally this method avoid touching of branches and fruits to soil results control of fruit rot. Regularly visited fields, suggested recommended sprayings, split application of fertilizer doses. Complete data collected about farmers regular practice, improved cultivation practices on cropping period, number of pickings, yield, fruit rot incidence, cost of cultivation, gross returns, net returns, benefit cost ratio, per cent increase in yield, farmers feed back from all the ten locations, finally compiled all the collected data (Fig. A).

OBSERVATIONS AND ANALYSIS

The findings of study as well as relevant discussion have been presented under following heads:

Yield parameters:

In the years 2012, 2013 total fruiting period of Demo plot is 5 months from August to December where as for check it is only 3 months from august to September. With improved cultivation practices plant growth is vigorous, controlling of pests and diseases during initial stages is possible in trellising method because of feasibility of easy moving between 2 rows for spraying of recommended pesticides, fungicides.

Average yield data from ten locations in the year 2012 is 1019 q/ha obtained in demo plot, 437 q/ha obtained in farmers practice (Check). Per cent increase of demo yield over check is 133 per cent. In the year 2013 average yield of demo from ten locations is 880 q/ha, where as check average yield is 430q/ha. Per cent increase of demo yield over check is 105 per cent (Table 1). Yields of demo plots are very highest almost double or more than double compare to check. 2 months total fruiting period increased in demo is one of reason for higher yields. The use of plastic mulch, and the practice of trellising also served to provide barriers between-the tomato fruits and the soil. Total control of fruit rot in demo due to trellising method results higher yields. with the plants supported by binder twine, no injury occurred

Table A : Details of FLD

Sr. No.	Year	No. of villages	No. of locations	Total area (ha)	Cropping period
1.	2012	4	10	2 (each location 0.2 ha)	8 months
2.	2013	4	10	2(each location 0.2 ha)	8 months

Table 1 : Average yield parameters of 10 locations

Year and season	No. of farmers	Area (ha)	Average yield (q/ha)		% increase in yield	Total fruiting period	
			Demo	Check		Demo	Check
<i>Kharif</i> , 2012	10	2	1019	437	133	5 months	3 months
<i>Kharif</i> , 2013	10	2	880	430	105	5 months	3 months

Table 2 : Comparison of economic impact between demo and check

Year and season	Average cost of cultivation (Rs./ha)		Average gross return (Rs./ha)	
	Demo	Check	Demo	Check
<i>Kharif</i> , 2012	177425	56425	1081550	262500
<i>Kharif</i> , 2013	1,72,240	58,530	1052320	235500

Table 2 : Continuation (E)

Demo	Average net return (Profit) (Rs./ha)		C:B ratio	
	Check	Demo	Check	Demo
904125	206075	6:1	5.6: 1	
880080	1769760	6:1	4:1	

and trellising was an effective means of reducing rots of stored tomatoes (Lockhart and Chipman, 1963). Total control of weeds due to plastic mulching, efficient utilization of water and soluble fertilizers at root zone of plants through drip irrigation are also reasons for high yields. Fruit size increased and quality improved in demo with good cultivation practices.

Economic impact:

On 1 rupee investment farmer got six rupees benefit in trial plot in two years 2012 and 2013. Whereas in check C:B ratio is 5.6 :1 in the year 2012 and 4 : 1 in the year 2013 (Table 2). Cost of cultivation is highest in demo due to high cost input materials used like drip irrigation, mulching and trellising method. Net profit is highest in demo plot compared to check plot. The reason is highest yields and good quality tomatoes.

Conclusion:

On economic point of view the initial investment is very high in demo even though the net profits are very high compare to farmers practice. So the proven scientific technology is more beneficial, improves socio-economic levels of farmers. In demo plot the quality and size of the fruit improved and attracts consumers in the market

facilitates easy and quick marketing. Post harvest losses drastically reduced. So when farmers cultivate crops by using improved scientific cultivation practices then only they got higher yields and net profits.

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