

TECHNOLOGY GENERATION FOR TOMATO PRODUCTION UNDER PLASTIC HOUSE CONDITION IN DIFFERENT ALTITUDES OF KASKI DISTRICT

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ABSTRACT

Farmer field verification and participatory varietal evaluation trials were conducted at 1600 msal (Naudada), 1200 msal (Hemja) and 800 msal (Tutunga) of Kaski district in 2008/9 under plastic house condition. There were 4 varieties of tomato (Thims1, Thims16, Srijana, and Bishesh) and 12 replications (one farmer as one replication) under Randomized Complete Block Design (RCBD). Altineem @3ml /lit of water; Alwin XL 2.5ml /lit of water; Imidagold 1.5ml/ lit of water and Lancergold 2g/lit of water were evaluated against whitefly. Similarly, ormicomin (25 g/plant), Furadan (carbofuran, 1g/plant), poultry manure (500 g /plant), mustard cake (50 g/plant), Neemajin (2 g/plant) were also evaluated for nematode. It was found that the tomato cultivar Thims 1 produced higher yield (18.2 ton/Ropani at 1600 msal; 12.06 ton/Ropani at 1200 msal; 8.97 ton/Ropani at 800 msal) in all the altitudes respectively followed by Srijana, Thims 16 and Bishes. Similarly, fruit of Thims 1 was also recorded higher weight of per fruit i.e. 107. 21 g followed by Thims 16 (91.02 g), Bishes (69.38 g), and Srijana (55.5 g). The total number of fruit per plant was highest in the cultivar Srijana (167.0) followed by Thims 1 (126.29), Thims 16 (71.66) and Bishes (54.61). It was also found that the mustard cake treatment resulted lowest scoring of nematode followed by poultry manure and Ormicomin. Similarly, Imidagold was the most effective insecticide to control white fly.

Key words: Mustard cake, Plastic house, root knot nematode, tomato, whitefly, ,

INTRODUCTION

Tomato (*Solanum lycopersicon* L.) is one of the most important commercially grown vegetable crop in Nepal and worldwide. The fruits are rich in vitamin C (31mg/100gm edible portion). The pulp and juice are digestible, a promoter of gastric secretion and blood purifier. It is also considered to be an intestinal antiseptic. Beside its supplement of vitamins and minerals in human nutrition, tomato improves the income of the growers, generates employment in rural and urban area and expands export potential (Ojha, 2004).

Tomato an annual herbaceous, best thrives in warm climate. It is a day neutral crop. According to Asian Vegetable Research and Development Center (AVRDC, 1999) an optimum night temperature of 15-20^o C is required for proper seed germination whereas 25-30^o C for proper growth and development of tomato. Tomato can be cultivated in loam to sandy loam soil, well drained and well fertile soil. In the hills, tomato can be produced successfully in two growing season: spring and rainy. Rainy season tomato is quite remunerative enterprise to the hill farmers as the supply from terai is constrained by high temperature induced low and flowering and fruit set, along with disease problems like bacterial wilt.

There is high demand of tomato but supply is less than the annual national demand. Nowadays it is commercially grown in plains (terai) and hills of Nepal with area coverage of 10,530 ha, total production of 72,657 tons and productivity of 6.9 ton/ha (Shrestha and Ghimire, 2006). The yield attributing characters such as number of branches per plant, number of flowers per cluster, number of fruit per cluster, number of fruit per plant and average weight of marketable fruits is a paramount role in accelerating yield (Ojha, 2007). Markets are unlimited outside and inside the country and prices are attractive during off- season i.e. from Ashad to Kartik. Increase in production can reduce the import. It further help tomato growers to increase income of the farmers which supports in poverty alleviation, income generation and ultimately in attaining food security. To develop off season tomato production technology, farmer field verification and participatory varietal evaluation trials were conducted under plastic house condition.

MATERIALS AND METHODS

Farmer field verification and participatory varietal evaluation trials were conducted on tomato under plastic house condition at 1600 masl (Naudada), 1200 masl (Hemja) and 800 masl (Tutungga) of Kaski district. The plot size was 12 meter square which accomplished 24 plants per plot. Compost @30 ton per hectare and NPK @100: 100: 100 kg per hectare were applied. The trial was carried out in Randomized Complete Block Design (RCBD) with 4 varieties of tomato (Thims1, Thims16, Srijana, and Bishesh) and 12 replications (one farmer as one replication). Altineem @3ml /lit of water; Alwin XL 2.5ml /lit of water; Imidagold 1.5ml/ lit of water and Lancergold 2g/lit of water were evaluated against whitefly. For nematode, six treatments were applied viz. Ormicomin (25 g/plant), Furadan (carbofuran, 1g/plant), poultry manure (500 g /plant), mustard cake (50 g/plant), Neemajin (2 g/plant), and control (nothing) and replicated five times. The necessary data on growth, yield and yield parameters were recorded and statistically analyzed.

RESULTS AND DISCUSSION

Marketable fruit yield

The result revealed the significant yield differences due to variety at all altitudes. The highest average yield of 18.2ton/ropani was recorded in Thims1 followed by Srijana, Thims 16 and Bishesh at Naudanda (1600 masl). The overall mean indicated that Thims1 gave the highest yield (13.07 ton/ropani) followed by Srijana (11.48 ton/ropani) in all altitudes (Table 1). In farmer's field majority of the farmers preferred Thims 1 and Srijana for yield and fruit quality. On the other hand, variety Bishesh gave lower yield in Naudada, Hemja and Tutungga locations. The research results also revealed that the higher loss of tomato fruits recorded in low altitude condition than that tomato grown in high altitude under plastic house condition. Higher losses at low altitude mainly due to high temperature which is favorable for late blight, fruit rot, septoria and fruit drop.

Table 1. Effect of different variety on marketable yield (ton/ ropani) of tomato in different altitude of Kaski district

Treatment	Marketable yield (ton/ropani)			Mean
	Naudanda (1600 masl)	Hemja (1200 masl)	Tutungga (800 masl)	
Bishesh	6.52	4.45	2.76	4.58
Srijana	15.56	10.18	8.70	11.48
Thims 1	18.20	12.06	8.97	13.07
Thims 16	12.05	9.56	3.83	8.47
F value	17.22**	19.92**	22.92**	
CV%	25.7	15.73	25.73	

Fruit size (gm) and plant height (cm)

The fruit size of different varieties of tomato used for study was statistically significant. Among the tested varieties Thims1 and Thims 16 gave large size fruit while Bishesh and Srijana produced medium size fruits. In case of fruit shape oblong in Thims 16 and Srijana and Bishesh was round in shape (Table 2). The individual fruit size/weight is very important in markets. Usually, Mansir to Shrawan months are favorable for large tomato, the weight which should range from 75-120 gram and rest of other months i.e. Badra, Aswin and Kartik months for small tomato having weight less than 65 gram (Budhathoki *et al.*, 2004). The result also showed that with the increase in altitude the plant height of tomato varieties was found highest. At Naudada, maximum plant height was recorded in Thims16 (338 cm) followed by Thims 1 (315 cm). In case of Hemja, the highest plant height was found in Srijana i.e 350 cm. Similarly in Tutungga, maximum plant height was recorded in Thims 16 (308 cm) followed by Thims 1 (288 cm) and Srijana (Table 2).

Table 2. Fruit size and plant height of different tomato varieties grown at different altitude.

Varieties	Naudada (1600 masl)		Hemja(1200 masl)		Tutunga(800 masl)	
	Fruit size (gm)	Plant height (cm)	Fruit size (gm)	Plant height (cm)	Fruit size (gm)	Plant height (cm)
Bishesh	75.85	150	70.75	105	61.55	90
Srijana	55.50	295	60.50	350	50.50	285
Thims 1	115.83	315	105.80	302	100.80	288
Thims 16	101.75	338	90.65	319	80.65	308
F value	16.68**	8.90**	19.68**	11.10**	14.68**	11.90**
CV%	25.88	14.84	20.88	19.24	30.85	17.84

Branch, number of fruit and number of cluster/ plant

The branches ranged from 5.33 (Srijana) to 3.5 (Thims 16) (Table 3). Total number of fruit per plant was highest in Srijana ranged from 225.17-125.50 which was followed by Thims 1,(139.33 -110.30). Whereas the lowest number of fruit per plant was found in variety Bishesh 45.60-62.65. The findings showed that with the increase in altitude the number of fruit per plant of all tomato cultivars was found increased. The tomato cultivar Thims 1 produced higher yield in all the altitudes followed by Srijana, Thims 16 and Bishesh. The number of fruits per plant among the cultivars was significant different at all altitudes (Table 3). Similarly, the highest number of cluster per plant was for the variety Srijana and the lowest was in Bishesh (Table 3).

Table 3. Number of branches, number of fruits and number of cluster in different variety of tomato in different altitude.

Varieties	Naudada (1600 masl)			Hemja (1200 masl)			Tutunga (800 masl)		
	No. of branch /plant	No. of fruit/ Plant	No. of cluster/pla nt	No. of branch / plant	No. of fruit/ Plant	No. of cluster/ plant	No. of branch /plant	No. of fruit/ Plant	No. of cluster/ plant
Bishesh	5.50	62.65	14.50	4.50	55.60	11.50	3.50	45.60	9.50
Srijana	5.0	225.17	24.25	6.00	150.10	22.10	5.00	126.50	21.50
Thims 1	4.10	139.33	19.00	6.25	129.25	15.50	4.5	110.30	12.50
Thims 16	4.17	92.50	15.85	4.10	72.50	11.80	2.25	50.00	9.67
F value	2.16 ns	12.05**	5.76**	2.16 ns	14.05**	7.76**	2.16 ns	12.05**	7.66**
CV%	26.69	24.03	25.96	21.60	29.03	35.96	21.60	24.03	35.90

White fly management

The highest yield per plastic house (392kg) was produced from the plot treated with Imadagold which is followed by plot treated with Ati-neem (354 kg). The lowest yield was obtained from the untreated plot i.e. only 262 kg per plastic house. This pattern of yield among different treated plots shows that Imadagold and Ati-neem not only reduce the number of whitefly population but also simultaneously accelerated yield of tomato. This increment on the yield of tomato is due to reduction of the whitefly population result on the low attack of tomato plant by whitefly insect because of the better effectiveness of these pesticides under plastic house condition. The yield obtained from Alwin XL and Lancer gold was comparatively lower yield as compared with other treatment represented by the Table 4.

Table 4. Fruit yield tomato varieties under different treatment for whitefly management. .

Treatments	Tomato fruit yield per plot (kg)				Total fruit yield/ treatment
	Thims 1	Thims 16	Srijana	Bishes	
Lancer gold	126	60	84	44	314
Imadagold	166	72	102	52	392
Alwin XL	132	65	98	41	336
Ati-neem	140	68	88	58	354
Control	90	62	76	34	262
Mean	130.8	65.4	89.6	45.8	

Root-knot nematode management

The effect of different types of treatments in plastic house tomato for nematode scoring has been presented in Table 5. The analysis of data revealed that there was significantly minimum score of nematode recorded in mustard cake followed by poultry manure and Ormicomin (Neem based organic fertilizer). Rest of the three treatments: control (3.920 per plant), use of Neemajin (3.6), and Furadane (3.4), were rendered higher incidence of nematode (Table 5).

Table 5 Scoring of nematodes in root of tomato grown under plastic house condition

Treatments	Root knot nematode gall in root (No.?)
Mustard Cake	0.04
Furadane	3.44
Poultry manure	1.08
Neemajin	3.64
Ormicomin	1.18
Control	4.92
CV%	18.73
LSD(P<0.05)	0.77

Table 6. Fruit yield of tomato varieties under different treatment for root knot nematode management.

Treatment	Tomato fruit yield per plot (kg)				Total fruit yield/ treatment
	Thims 1	Thims 16	Srijana	Bishesh	
Ormicomin	138	65	75	41	319
Mustard Cake	155	80	102	50	387
Poultry manure	145	68	110	44	367
Neemajin	102	57	85	36	280
Furadane	90	55	72	33	250
Control	75	51	75	28	229
Mean	117.5	51.3	86.5	38.6	1832

The finding showed highest yield per plastic house (387 kg) had been produced from the plot treated with Mustard Cake which is followed by plot treated with Poultry manure (367 kg). The lowest yield was obtained from the untreated plot i.e only 229 kg per treatment.

The increment on the yield of tomato yield is due to reduction of the root knot nematode population because of the better result of these Mustard Cake and Poultry manure under plastic house condition (Table 6).

CONCLUSION AND RECOMMENDATION

From the above mention results, it is concluded that the tomato Thims 1 produced maximum marketable yield in all altitudes. Srijana is second suitable variety under polyhouse condition in all altitudes. Similarly, Mustard cake and poultry manure is effective treatment for nematode management. Furthermore, Imidagold can be recommended to control white fly.

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