



Status of Protected Cultivation of Vegetables in Punjab

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ABSTRACT

Protected cultivation practice is a cropping technique wherein the microclimate surrounding the plant body is controlled partially or fully as per the requirement of vegetables. The study regarding status of protected cultivation technology was conducted by selecting various farmers who were adopting this technique in district Amritsar and Tarn Taran and the data were collected by personal field visit and interview schedule with farmers. In Amritsar district of Punjab, total area under protected cultivation was 158.70 ha with a production of 806.88 Mt of vegetables and 2 lakh seedlings of vegetables while in Tarn Taran district of Punjab the area was 23.4 ha with production of 476 Mt of vegetables. The low cost technology of vegetable cultivation was helpful for cultivation of vegetables like Brinjal, Tomato, Pumpkin, Cucumber, Capsicum, Summer Squash, Chilli, Squash Melon, Summer Squash + Cucumber and Capsicum + Cucumber in both of districts. By growing these crops in poly houses, shade nets and under low tunnels farmers were getting early yield of 9 to 46.6 q/ha, total yield of 115 to 650 q/ha and net income of Rs38,000/- to Rs.1,12,000/-ha by advancing the crop to about 30-40 days. Crops like Capsicum + Cucumber, Summer Squash + Cucumber and Capsicum were more responsive under protected cultivation of vegetables.

Key Words: Protected cultivation, Low tunnel technology, Yield, Off-season cultivation

INTRODUCTION

The cultivation of vegetables has special significance in horticulture because of their short duration, low volume and high value. The total area under vegetable production in Punjab during 2021 was 305.5 lakh ha and production of 6109.56 lakh tones with total productivity of 19.91 t/ha (Anonymous, 2021). Protected cultivation practice is a cropping technique wherein the microclimate surrounding the plant body is controlled partially or fully as per the requirement of vegetables (Nair and Barche, 2014). This technology is modern and capital intensive, but has capacity to increase the productivity of vegetable by many folds and also improve the quality of the vegetables. It has very good potential for growing high values vegetables crops like tomato, cucumber, pepper, summer squash, brinjal, beans, spinach, pea and coriander, healthy and virus free seedlings.

Cultivation of off-season vegetables by the adoption of protected cultivation is the best alternative for vegetable growers to fetch higher prices in the market through earlier crop production by 30-35 days as compared to the main season crop (Paroda, 2013). Off season vegetable cultivation is needed to increase the total vegetable production, ensure year-round supply of fresh vegetables, manifold increase in production from same unit area and ensuring better quality produce by exploiting existing agro-climatic advantages and using protected structures (Singh, 2005 and Sanwal, 2013). Moreover, cultivation of vegetables is possible in hostile climates through protected structures. Jensen and Malter (1995) reported that protected cultivation is a technique used to modify a plant's natural environment in order to optimize plant growth. Many cucurbits (Squash, Cucumbers and Melons) respond well under row covers

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with increased yields of as much as 25 per cent (Helbacka, 2002). Row covers are used to enclose one or more rows of plants in order to enhance crop growth and production by increasing both air and soil temperatures and reducing wind damage (Hochmuth *et al*, 2000). The farmers generally enquire about the enhancement of the economic returns by the adoption of low tunnel technology. Dickerson (2009) also reported that row covers supported with wire hoops will protect the crop from wind. Therefore, the objective of the study was to find the response of different vegetables under protected cultivation in Amritsar and Tarn Taran district to get off season vegetables.

MATERIALS AND METHODS

A study was undertaken regarding protected cultivation technology to get early vegetable crops for early and higher yield during off season at district Amritsar and Tarn Taran of Punjab during 2020-2021. Amritsar, city is Northern Punjab state of Northwestern India. The *latitude* of Amritsar is 31.63 and the *longitude* is 74.87. Tarn Taran district is one of the districts in the Majha region of Punjab, India. *Tarn Taran Latitude* 31.46 *Longitude* 74.92.

A total of fifteen blocks where vegetable growers practicing protected cultivation were selected from district Amritsar and Tarn Taran. These blocks were Attari, Ajnala, Rayya, Tarsika, Majitha, Verka, Jandiala Guru, Chogavan and Harsha Chhinna from Amritsar. In Tarn Taran, the various blocks include Patti, Bhikhiwind, Gandiwind, Khadoor Sahib and Chohla Sahib. The various protected cultivation structures include Polynet houses, low tunnels and walk in tunnels. Polynet-house is a framed structure consisting of GI pipes covered with ultra violet (UV) stabilized plastic film of 200-micron thickness at the top and UV stabilized net of 40-mesh size on the sides. A low tunnel is made of flexible transparent materials and is used to enclose one or more rows of plants in order to promote the crop growth by warming the air around the plants during winter season.

Vegetable crops like Brinjal, Tomato, Pumpkin, Cucumber, Summer Squash, Chilli, Squash Melon and combination of vegetables like Summer squash+ Cucumber, Capsicum+ Cucumber and vegetable nursery were grown in protected cultivation under poly houses, low tunnels and by shade nets. The sowing was done during first fortnight of November to December before the onset of winter and chilling temperature. The whole crop was protected by using non perforated plastic sheet of 50-micron thickness. When the temperature starts warming, remove the sheet in second fortnight of February.

Various farmers practicing protected cultivation technology in district Amritsar and Tarn Taran were identified by field visit and survey. The cultural practices and crops grown by them were identified. For the collection of data, about twenty random farmers who were practicing this technology were selected from Amritsar and Tarn Taran district. The data were collected by personal field visit and interview schedule with farmers. The package of practices regarding various crops cultivated in protected structure were identified along with their sowing time, harvesting time, early yield in (q/ha), total yield in (q/ ha) and net income (Rs/ha).

RESULTS AND DISCUSSION

The data regarding various blocks of district Amritsar and Tarn Taran of Punjab where protected cultivation has been practiced is presented in Table 1 and 2. In these blocks various vegetables crops like tomato, cucumber, summer squash, brinjal, pumpkin, chilli, capsicum, and squash melon were grown under protected conditions by poly houses, low tunnels and shade nets.

In district Amritsar (Table1), the total area under protected cultivation was 158.70 ha having production of 806.88 Mt and 2 lakh vegetable seedlings. The major blocks where protected cultivation was done were Attari, Ajnala, Rayya, Tarsika, Majitha, Verka, Jandiala Guru, Chogavan and Harsha Chhinna. The maximum area of 123.02 ha was found in block Jandiala while lowest area of

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Table 1. Area, yield of vegetables under low tunnel and protected cultivation in Amritsar district.

Sr. No	Block	Mode of cultivation of Vegetables	Area (ha)	Average Yield (Kg/ha)	Production (MT)
1.	Attari	Poly House	0.177	70000	11.9
2.	Ajnala	Poly House	0.40	90000	36.0
3.	Rayya	Low Tunnel	8.0	37000	296.0
4.	Tarsika	Low Tunnel	15.0	38000	570.0
5.	Majitha	Low Tunnel/Shade net houses	9/1.2	37500/120000	337.5/ 144
6.	Verka	Poly house	1.2	80000	96.0
7.	Jandiala Guru	Poly house/Low Tunnel	0.2/ 123.0	0/52500	2 lakh seedlings/ 6457.5
8.	Chogavan	Poly house	0.23	65000	14.9
9.	Harsha Chhinna	Poly house	0.30	35000	10.5
	Total		158.70		806.88/ 2 lakh seedlings

0.12 ha in block Attari, having total area of 158.70 ha. In Jandiala block the production under poly houses and low tunnels was 2 lakh seedlings from vegetable nursery and 6457.5 mt of vegetables. In block Tarsika the total area under protected cultivation of 15 ha having production of 570 Mt of vegetables.

In district Tarn Taran (Table 2) the total area under protected cultivation was 23.4 ha having production of 476 Mt. The major block for protected cultivation includes Patti, Bhikhiwind, Gandiwind, Khadoor Sahib and Chohla Sahib. The highest area was found in block Chohla Sahib having area of 13.2 ha having production of 141 mt followed by other blocks. In Khadoor Sahib block the total area under protected cultivation was 5.2 ha having production of 77 Mt.

The sowing and harvesting time of different vegetables grown under protected cultivation is presented in Table 3.

The crops like Brinjal, Tomato, Pumpkin, Summer Squash and Cucumber were sown during December while the harvesting was done from February onward to catch early yield. Different

crops were protected against winter during December to February under various protected structures like low tunnel and poly houses. The Capsicum seedlings were transplanted during first fortnight of November and crop was harvested from end of March to May. The crop of Summer Squash + Cucumber was sown during Mid December while harvested from first week of March to end May. The crop of Capsicum + Cucumber was sown during first fortnight of November while harvested from February-May.

The harvesting span (days) and early yield (q/ha) of different vegetables grown under protected cultivation is presented in Table 4.

The minimum harvesting span was given by vegetable like Summer Squash of 35 days while maximum harvesting span was reported by Capsicum +Cucumber of 93 days crops under protected structure, having average of 57.3 days in Amritsar district. In Tarn Taran district, the minimum harvesting span was given by Brinjal of 36 days while maximum harvesting span was reported by Capsicum +Cucumber crops of 95 days, having average of 58.7 days.

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Table 2. Area, yield of vegetables under low tunnel and protected cultivation in Tarn Taran district

Sr. No	Block	Mode of cultivation of Vegetables	Area (ha)	Average Yield (Kg/ha)	Production (MT)
1.	Patti	Shade Net/ Low tunnel	3.2	173600	66
2.	Bhikhiwind	Low tunnel	0.4	14650	5
3.	Gandiwind	Poly house	0.4	115500	46
4.	Khadoor Sahib	Low tunnel	5.2	59300	77
5.	Chohla Sahib	Low tunnel	13.2	150000	141
6.	Tarn Taran	Shade Net/Poly house	1.2	230540	81
	Total		23.4		476

Table 3. Sowing various vegetable crops along with their sowing and harvesting time grown under protected cultivation at district Amritsar and Tarn Taran.

Sr. No	Vegetable	Sowing Time	Harvesting Time
1.	Brinjal	First fortnight of December	Mid February to April
2.	Tomato	First fortnight of December	Mid February to April
3.	Pumpkin	First fortnight of December	Mid February to April
4.	Cucumber	First fortnight of December	End February to 20th April
5.	Capsicum	Seedlings were transplanted during first fortnight of November	End March to May
6.	Summer Squash	Mid December	March to first week of April
7.	Chilli	Seedlings were transplanted during first fortnight of November	April to 10th June
8.	Squash Melon	First fortnight of December	First week of April to end May
9.	Summer Squash + Cucumber	Mid December	First week of March to end May
10.	Capsicum + Cucumber	First fortnight of November	February-May

The minimum early yield was given by vegetable like Cucumber 11.2q per ha while maximum early yield was reported by Capsicum +Cucumber 46 q per ha under protected structure, having average of 28.76q per ha in Amritsar district. In Tarn Taran district, the minimum early yield was given by vegetable like Pumpkin 9 q/ha while maximum early yield was reported by Cucumber 42 q/ha under protected structure, having average of 24.7q/ha. The early yield of different vegetables significantly differs from each other in both the districts. This may be due to different effect of climate, soil and cultural operations under both the districts.

The total yield (q/ha) and net income (Rs/ha) of different vegetables grown under protected cultivation is presented in Table 5.

The minimum total yield was given by vegetable like squash melon 125q per ha while maximum total yield was reported by Capsicum 650 q/ha and Capsicum + Cucumber 625q/ha under protected structure, having average of 457.5q/ha in Amritsar district. In Tarn Taran district, the minimum total yield was given by vegetable like squash melon 115q/ha while maximum total yield was reported by Capsicum 625 q/ha and Capsicum + Cucumber 540q under protected structure, having

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Table 4. Sowing various vegetable crops along with their harvesting span in days and early yield (q/ha) at district Amritsar and Tarn Taran.

Sr. No	Vegetable	Harvesting Span (days) Amritsar	Harvesting Span (days) Tarn Taran	Early yield (q/ha) Amritsar	Early yield (q/ha) Tarn Taran
1.	Brinjal	38	36	34.8	30.1
2.	Tomato	40	42	29.4	20.5
3.	Pumpkin	39	41	11.2	9.0
4.	Cucumber	52	55	44.0	42.0
5.	Capsicum	65	62	38.2	35.1
6.	Summer Squash	35	39	15.0	12.3
7.	Chilli	67	68	13.8	12.9
8.	Squash Melon	55	58	11.2	10.2
9.	Summer Squash + Cucumber	89	91	43.4	35.9
10.	Capsicum + Cucumber	93	95	46.6	39.0
	Mean	57.3	58.7	28.76	24.7
	Range	35-93	36-95	11.2-46.6	9-42

average of 418.5q/ha. The total yield of different vegetables significantly differs from each other in both the districts. This may be due to different effect of climate and soil conditions under both the districts. Bhullar (2012) suggested that protected cultivation of vegetables increased yield in covered vegetables as compared to plots without covering. The covering also affected the size of vegetables and better quality of vegetables. Gupta (2012) suggested that the off-season cultivation of chilly as main crop along with cucumber as intercrop under low tunnels is the most beneficial cropping pattern to enhance the economic returns of the farmers.

The minimum net income was given by vegetable like Summer Squash Rs 42,000/-ha while maximum net income was reported by Capsicum+ Cucumber of Rs 1,12,000/-ha and Capsicum of Rs 90,000/- under protected structure, having average net income of Rs 67,280/- ha in Amritsar district. In Tarn Taran district, the minimum net income was given by vegetable like summer squash Rs 38,000/-ha while maximum net income was reported

by Capsicum+ Cucumber of Rs 95,000/-ha and Capsicum of Rs 84,000/- under protected structure, having average net income of Rs 62,100/-ha. The net income of different vegetables significantly differs from each other in both the districts. This may be due to different buying conditions of customers under both the districts.

CONCLUSION

It was concluded that protected cultivation by low tunnels, shade nets and poly houses was very effective for getting early vegetable in different blocks of Amritsar and Tarn Taran and gave good profit to farmers in producing off season vegetables. The crops like Capsicum + Cucumber, Capsicum and Cucumber produced maximum yield and net income of Rs38,000/- to 1,12,000/-ha. This technology was helpful to protect the plants from cold during December to February months and helpful to advance the crop by 30 to 40 days than normal season.

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Table 5. Sowing the total yield (q/ha) and net income (Rs/ha) of various vegetable crops grown under protected cultivation at district Amritsar and Tarn Taran

Sr. No	Vegetable	Total yield (q/ha) Amritsar	Total yield (q/ha) Tarn Taran	Net Income (Rs/ha) Amritsar	Net Income (Rs/ha) Tarn Taran
1.	Brinjal	550	500	56000	52000
2.	Tomato	575	525	64000	61000
3.	Pumpkin	375	337	72000	68000
4.	Cucumber	500	462	70000	65000
5.	Capsicum	650	625	90000	84000
6.	Summer Squash	225	205	42000	38000
7.	Chilli	375	350	52000	50000
8.	Squash Melon	125	115	52800	50000
9.	Summer Squash + Cucumber	575	525	62000	58000
10.	Capsicum + Cucumber	625	540	112000	95000
	Mean	457.5	418.5	67280.0	62100.0
	Range	125-650	115-625	42000-112000	38000-95000

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