

Original Research Article

Summer Squash farming under trench protected structure in cold deserts of India

Abstract

Summer squash is a quick growing and early yielding cucurbit which performs well in cool and moist weather conditions. Early growing season and later harvest season encounter with low temperatures restricting summer squash cultivation commercially. Summer squash cultivation in Ladakh have generally been restricted to limited pockets due to lack of awareness about technological advancement like proper protected cultivation and use of poor quality of planting material even in protected structures are also responsible for low productivity. Therefore, varietal trial under trenches was conducted with a view to increase yield and availability period. Summer squash var. All Green is highest yielder with highest fruit weight and no. of marketable fruits. More than 100 per cent increase in summer squash yield is estimated in trenches as compared to open cultivation. Therefore, this technology comprising trench and summer squash var. All Green may be upscaled to similar climatic condition with high wind velocity to enhance farm income of the farmers.

Key words: Cold arid, Ladakh, summer squash, trench

Introduction

Summer squash (*Cucurbita pepo* L.) is an economically important member of the gourd family, Cucurbitaceae. Summer squash is a warm season, New World vegetable crop, well adapted to temperate and sub-tropical region. It is a quick growing and early yielding cucurbit which performs well in cool and moist weather conditions. It ranks high in economic importance among vegetable crops worldwide. A native of North America, summer squash has been grown in Europe since the renaissance. There are six extant horticultural groups of summer squash: cocozelle, crookneck, scallop, straightneck, vegetable marrow, and zucchini (Parry, 1996). Most of these groups have existed for hundreds of years. Their differing fruit shapes result in their differential adaptations to various methods of culinary preparation. The groups differ in geographical distribution and economic importance. The zucchini group, a relatively recent development, has undergone intensive breeding in the United States and

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Comment [B12]: Contradicting idea.

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Europe and is probably by far the most widely grown and economically important of the summer squash. Summer squash is also known as bush squash, vegetable marrow, Vilayati Kaddu/Chappan Kaddu/Safed Kaddu (Thamburaj and Singh, 2001) in India.

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Ladakh is the high altitude Trans Himalayan region of India. The area is sandwiched between the Greater Himalayas in its south and the Karakoram ranges in the north. The major portion of Indian cold arid (68321 sq Km out of total 74809 sq Km) constitutes Ladakh. Such a geographical setting manifests itself into some peculiar agro-climatic conditions that prevail in High Himalayas. Extreme cold and aridity coupled with large seasonal as well as diurnal variation in temperature are limiting factors affecting agricultural productivity adversely. In Ladakh region, cold desert of India, summer squash cultivation is mostly confined in the vicinity of Leh town where summers are mild, the sowing season starts from May and the crop matures in July onwards. Early growing season and later harvest season encounter with low temperatures which is a major constraint restricting vegetable grower to cultivate summer squash commercially by adversely affecting crop growth and yield. Summer squash cultivation in Ladakh have generally been restricted to limited pockets due to lack of awareness about technological advancement like proper protected cultivation and use of poor quality of planting material even in protected structures are also responsible for low productivity (Singh *et al.*, 2010). Though Ladakh region have various types of protected structures viz. polyhouses, trenches and low tunnels, the trench cultivation has proven its worth in realizing more output per unit of inputs and resources bestowed on to land as an alternative to raise production and productivity especially to meet out own requirements. Seeing the efficacy, there is need of harnessing and leveraging the potential of trench cultivation on commercial scale with variety of vegetables. A number of improved cultivars have been available in this crop but no effort has been made so far to evaluate them for their suitability of growing under protected condition in Ladakh. In this context, varietal evaluation is felt essential to identify suitable varieties for its production with superior attributes.

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Materials and Methods

Though, Summer squash (*Cucurbita pepo* L.) is not a major crop of Ladakh region and is grown on small scale during summers in Ladakh region, its early availability for

consumption may attract the farmers. Although, it can grow in open field conditions in lower belts of Leh district but its real potential can be realized only under protected structures. The experiment was conducted during summer in trenches (Size 10 ft long x 6 ft wide x 1.5-2 ft deep) at Vegetable Research Farm, Stakna (Leh) which is situated at 3319 m amsl with latitude 33°58.551' NS and longitude 77°41.995' EW. Climate of the area is typically dry temperate with extreme fluctuations in the temperature and high wind velocity. As the trenches are underground, high wind velocity can be overcome in these structures. Soil of the experimental field sandy loam. Design of the experiment was RBD with five genotypes and material was replicated 4 times. Data were recorded for 5 characters and subjected to statistical analysis. Comparison was done among varieties for their performance.

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Results and Discussion

Though food security in Ladakh is taken care of by an efficient PDS, nutritional and income insecurity are the principal concern for the policy makers. Fresh vegetables and fruit are always in short supply in the region. Only 5000 tonnes of fresh vegetables are produced locally during the growing season whereas demands of only the army stationed in Ladakh is around 13000 tonnes annually. Vegetable crops are care intensive and require proper upkeep and management so as to harvest their really vested potential. Harvesting more return from a unit area of land, disguised unemployment, improper availability of fruits and vegetables, malnutrition, generating employment, diversification and satiating needs of dominion population are major concern awaiting for strategic initiation and integration having bearing on hastening production and quality.

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Analysis of variance (Table 1) indicated that there are highly significant differences among genotypes under study for plant height, harvest duration, fruit weight, fruit length and fruit diameter and significant differences for yield per ha. Non significant variation was observed among genotypes for number of fruit per plant. Mean performance of genotypes is presented in the Table 2.

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Plant characters

Perusal of data for plant characters in Table 2 indicated that summer squash variety All Green had highest plant growth (137.75 cm) which is superior to all the genotypes except Seol Green. All the genotypes non significantly different from each other for number of fruits being highest in genotype All Green. Similarly, variety All Green was also found to be highest yielder (1206.875 qt/ha) and was at par with Dark Green Zucchini and Seol Green. Significantly longer harvest duration was recorded in variety All Green as compared to the other genotypes. Pandey et al. (2018) recorded maximum yield of 1033.72 qt/ha in polyhouse conditions in Terai region of Uttrakhand.

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Fruit characters

Mean performance of summer squash genotypes for fruit characters is also given in Table 2. Four genotypes viz All Green, Seol Green, Pusa Alankar and Dark Green Zucchini exhibited performance at par with each other for fruit weight. Maximum average fruit weight (1320 gm) was recorded by Pandey et al. (2018) in polyhouse conditions.

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Similarly, all these four varieties were at par with respect to fruit length. All Green showed significant superiority for fruit diameter overall the other genotypes except Seol Green and Pusa Alankar.

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Average yield recorded under open field conditions in Ladakh was only 350-400 qt/ha with shorter harvest duration of 60-80 days only. In consonance with the present findings, Pandey et al. (2018) also observed significant increase in polyhouse condition over open field cultivation for fruit yield, number of fruits per plant and fruit weight.

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Results of present investigation revealed that variety All Green is highest yielder with highest fruit weight and no. of marketable fruits. On the basis of this study, more than 100 per cent increase in summer squash yield is estimated in trenches as compared to open cultivation. Therefore, this technology comprising trench and summer squash var. All Green may be upscaled to similar climatic condition with high wind velocity to enhance farm income of the farmers.

Comment [B46]: How did you calculate it? The formula is shown below: Maximum-minimum/minimum X 100%.

Comment [B47]: Hence, the production technology of summer squash var. All green under trench might be....

Comment [B48]: Genotypes are variable based on their difference in environmental adaptability and other factors.

References

- Singh P.K., Maurya S.K., Singhal P., and Joshi G. 2010. Performance of Summer squash for off season cultivation under protected condition in tarai region of Uttarakhand. National Seminar on Protected Cultivated of Vegetables and Flowers-A value chain approach (11-12 January, 2012; Pantnagar, India). Book of Abstracts, 12
- Thamburaj S., and Singh N. 2001. Textbook of Vegetables, Tuber crops and Spices. Indian Council of Agricultural Research, New Delhi, 286p.
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Table 1: Analysis of variance for different characters

Sources of variation	df	MSS						
		Plant height	No. of fruits	Yield/ha	Harvest duration	Fruit weight	Fruit length	Fruit diameter
Genotypes	4	3926.075**	0.575	337179.22*	241.125**	0.583**	98.439**	437.103**
Replications	3	34.467	0.600	64315.00	47.783	0.148	2.366	96.207
Error	12	156.008	0.642	62593.38	33.658	0.088	9.189	43.987

**Significant at 1% level of significance

* Significant at 5% level of significance

Table 2: Mean performance of summer squash genotypes for various characters in trenches

Genotypes	Plant characters				Fruit characters		
	Plant height (cm)	No. of fruits/plant	Yield/ ha (qt)	Harvest duration (days)	Fruit weight (kg)	Fruit length (cm)	Fruit diameter (mm)
Australian Green	63.75	4.75	394.375	90.75	0.831	28.975	75.370
Pusa Alankar	94.00	5	770	99.25	1.525	40.40	93.930
Dark Green Zucchini	87.00	5	871.250	101.25	1.456	40.225	89.285
Seol Green	132	5	855	100	1.663	37.40	97.395
All Green	137.75	5.75	1206.875	112.5	1.838	40.65	102.98
CD(0.05)	19.245	NS	385.484	8.939	0.457	4.671	10.219