THE ASIAN JOURNAL OF HORTICULTURE
Volume **9** | Issue 1 | June, 2014 | 106-108
e ISSN- 0976-724X | Open Access-*www.researchjournal.co.in* |

Research Paper

Article history **:**
Received : 06.11.2013
Revised : 19.04.2014
Accepted : 29.04.2014

Low tunnel technology a valuable vegetable forcing intervention for boosting economy of farmers in Ladakh

■ **MOHD MEHDI[1], FAIZAN AHMAD** AND **NAZIR HUSSAIN[1]**

Members of the Research Forum

Associated Authors:
[1]Krishi Vigyan Kendra (SKUAST), KARGIL (J&K) INDIA

ABSTRACT : Result of a comparative evaluation of low tunnel technology and traditional growing of cabbage under three different locations in Kargil district is presented here. Low tunnel technology increased seed germination from 75.3% to 91% and seedling survival on transplanting from 76.3% to 96.6%. Time taken for production of marketable seedling as well as attaining marketable cabbage heads reduced from 53 to 45.6 days and 85.3 to 75.3 days, respectively. Use of this technology advanced the growing period of crop by almost two months. The total cabbage yield and net profit per unit area were above normal when grown under low tunnels as the produce reached the market early avoiding the market glut.

KEY WORDS : Low tunnel, Cold arid, Cabbage, Season advance, Vegetable forcing

HOW TO CITE THIS ARTICLE : Mehdi, Mohd, Ahmad, Faizan and Hussain, Nazir (2014). Low tunnel technology a valuable vegetable forcing intervention for boosting economy of farmers in Ladakh. *Asian J. Hort.*, **9**(1) : 106-108.

Author for correspondence :
FAIZAN AHMAD
Krishi Vigyan Kendra (SKUAST), KARGIL (J&K) INDIA
Email : faiz_an@rediffmail.com

Ladakh, the cold arid region of Jammu and Kashmir state experiences prolonged severe winter and has a short cropping season starting from last week of March to last week of September; in double cropped areas and from first week of May to last week of August in mono-cropped areas.

With increased health awareness in general public and changing patterns, vegetables are now becoming an integral part of average house hold's daily meals. In addition, high population growth rate, availability of packaged and air lifted fresh vegetable from distant markets has, therefore, generated a year round high demand for vegetable in this region. However, farmers have yet not been able to en-cash this opportunity and still follow traditional methods of production. This results in highly volatile vegetable supply in market; wherein the market is flooded with seasonal vegetables irrespective of demand on one hand and extremely poor supplies and high priced vegetable in off season on the other hand.

Due to high altitude the intensity of solar radiation and long photoperiod (12-14 h) is good enough to support crop growth but the aridity and speedy wind dips temperature which limits growing of crops for large part of the year (Sharma, 2000). Adoption of low tunnel technology increased cropping intensity to 300% in cold arid region (Mir *et al*., 2009). For tapping the solar energy various types of forcing structures like green house, Ladakhi green house and trench have been successfully introduced, but lack readily acceptability due to limitations in term of high initial costs, continuous power requirement, maintenance and replacement of soil after every 2-3 years for protection against soil born disease and insect pest. Hence, a low cost and low maintenance technique, low tunnel technology was tried that ensures supply of vegetable during scarcity and help the grower to obtain reasonable and profitable return of their produce.

RESEARCH METHODS

On farm trail on cabbage hybrid 'Mitra' was conducted during the year 2011-12 to compare the efficiency of low tunnel technology and traditional open field growing of vegetable at ten locations in Kargil district. Out of these, three spots were selected, where frequent timely visits for observation and data recording was possible.

For preparing the supporting structure of low tunnel were

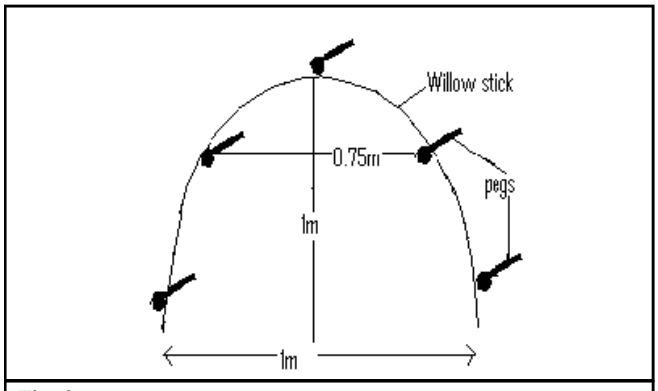

Fig. A :

made by using locally and abundantly available 2.5 m long, freshly cut willow sticks of 1.5 to 2 cm diameter. To obtain uniform curvature, sticks were moulded by keeping them fixed in 0.5 m long strong pegs, nailed into ground at 5 different points along a prefixed curve, to obtain a diameter of 1m, till the time these were dry and hard enough to provide sufficient support without losing the shape as illustrated in Fig. A. After drying the arc shaped willow sticks were fixed at the proper site by inserting 15 cm deep into the soil at intervals of 75 cm to 90 cm, depending upon the diameter of the sticks. Seed for raising nursery were sown in the first week of February and transplanted in third week of March. The tunnel was covered with ordinary transparent polythene (2.4 m wide), with lateral supports and packed from all the sides. The polythene covering was removed gradually as the outside temperature became favorable for plant growth, starting with opening of tunnel at both ends; followed by complete lifting during day time. The covering was removed completely after mid May. As dictated by weather, under open field conditions sowing and transplanting were possible only in the first week of April and third week of May, respectively. Adoption of this technology advanced the growing of the crop by around two months, in this region. Observations on germination percentage, days taken to attain marketable seedlings, survival of transplants and percentage head formed plants were recorded. Harvesting of cabbage head was done by keeping unwrapped leaves intact with plant and allowing the plant to produce super heads (Ratooning) which is the novelty of this hybrid as tested earlier both under low tunnel and open field conditions. For average head weight 30 randomly selected heads from each trial, were weighed and average worked out. Yield per unit area was calculated by multiplying average head weight and number of head formed plants. Most of the new head sprouts were removed retaining a maximum of two heads per plant to obtain saleable heads. The yield of super heads was recorded, as above. Data were analyzed using the test of two independent means suggested by Herzberg (1983).

RESEARCH FINDINGS AND DISCUSSION

Results of various traits of cabbage hybrid (Mitra) grown at 3 different locations in Kargil during the year 2011-12 are presented in Table 1 and 2. The results were interpreted on the basis of mean of the three locations for each trait. Seed germination percentage ranged from 87-96 % in low tunnel compared to 70-84 % in open field condition. This technology reduced days taken to reach the 3-4 leaf stage, which is

Table 1 : Comparison of low tunnel with open field on growth and yield of cabbage hybrid

Characters	Location -1		Location -2		Location -3		Average	
	Low tunnel	Open field	Low tunnel	Open field	Low tunnel	Open field	Low tunnel	Open field
Germination (%)	90	72	96	84	87	70	91*	75.3
Days to maturity of seedlings	46	52	48	54	46	51	46.6*	53.0
Transplantation survival (%)	98	81	98	75	94	73	96.6*	76.3
Days to head maturity	72	88	70	86	75	82	72.3*	85.3
No. of head formed plant (%)	96	91	98	90	95	88	96.3*	89.6
Average head weight (kg)	0.86	1.01	0.96	0.98	0.81	0.82	0.87	0.93
Yield (q/ha)	555.79	652.56	633.34	587.88	518.02	562.32	569.0	600.9
Yield of super heads (q/ha)	278.58	191.55	301.92	186.76	280.30	180.43	290.2*	186.2

Table 2 : Economics of the technology

Location	Yield of main crop (q/ha)	Retum (Rs./ha)	Yield of super heads (q/ha)	Retum (Rs./ha)	Gross income (Rs./ha) (3+5)	Cost of input (Rs./ha)	Net profit (Rs/ha)
1	2	3	4	5	6	7	8
Low tunnel	569.05	6,82,860	290.26	2,32,208	9,15,068	95,200	8,20,008
Open field condition	600.92	4,80,736	186.24	1,48,992	6,29,728	-	6,29,728
% increase over open field		42.2		55.82			30.21

Cost of input includes only cost of polythene and willow sticks keeping a life span of 1 and 3 years respectively.
Sale rate of main crop under low tunnel (off season) Rs.12/kg and rest @ Rs. 8/kg

considered fit for transplanting, from 53 to 45.6 days. Good moisture supply and protection from fluctuating temperature under low tunnel may be the cause of increased germination percentage and rapid growth. Rapid germination also avoids the chance of attack by soil micro-organisms (Chatterjee, 1990). The survival of seedlings after transplanting is very critical in Ladakh condition due to dry weather and high speed desiccating winds. In low tunnels survival of seedlings after seven days was found to be superior (96.6 %) while as in open condition only 76.3 % seedlings survived. Flood irrigation immediately after transplanting might be the cause of reduced survival percentage in open field condition which most of the time becomes necessary due to high evaporation rate coupled with porous soils. To keep the soil moist, in open planting, manual fountain bucket watering, 2-3 times a day is required, which is laborious and adds to the cost of cultivation while in low tunnel single manual fountain bucket watering is quite sufficient for three to four days, which meets the requirement because of drastically reduced rate of evaporation and recycling of the evaporated moisture. Improved microclimate resulted in early maturation coupled with increased proportion of head formed plant in low tunnels. The average head weight was more in open field because of the high light intensity, which increases the rate of photosynthesis (Jain, 2005) but was not able to compensate the yield difference. The early maturation of heads under low tunnel provided sufficient time to gain size and firmness of super heads which resulted in 55.8% increase in yield of super heads over open field grown cabbage.

Under low tunnel the heads were ready for harvest in the first fortnight of June and fetched the early market high price (Rs. 10-14 per kg) as at this point of time only distant produced vegetables are available in the market. Further due to nuclear family system the demand of super heads which weigh about 200-400 gram were preferred, purely for economic reasons, as open field grown big sized cabbage heads weighing around two kg are easily available in the market during this period, and not required for small families.

Early maturation of main crop and small compact super heads produced under low tunnel not only protected grower from market glut but also raised net profits, to as high as Rs. 8,20,008/ha against Rs. 6,29,728 /ha earned from the crop grown in open field condition (Table 2).

Low tunnel technology is a suitable technology for the region, which is low cost than other forcing structures, has potential to increase the per unit area returns and can play a positive role in nutrition by making vegetable available in the off-season. The technology needs testing with other crops as well.

Acknowledgement:

This trial was conducted with the support of KVK, SKUAST-K, Kargil, which is duly acknowledged.

REFERENCES

Chatterjee, S.S. (1990). Cole crops. In : *Vegetable crop*s (Bose, T. K. and Som, M.G., Eds). Naya Prakash Publishing Co., Kolkata. pp.186.

Herzberg, P. A. (1983). The test of two independent means. *Principles of statistics.* John Wiley and Sons. 249-252 pp.

Jain, V.K. (2005). Factors affecting photosynthesis. *Fundamentals of plant physiology.* Chand company Ltd. New Delhi. 225-278 pp.

Mir, M.S., Saleem,T., Mehdi, M., Ahmed, F. and Rai, H.K. (2009). Cracking the problems of sustainability of small holdings in the cold arid regions through low tunnel. Paper presented in 9th Agricultural Science Congress on "Technological and Institutional innovations for enhancing agricultural income" held at SKUAST-K, Srinagar from 2224' June 2009.Abstract book pp 50-51.

Sharma, J.P. (2000). Climate of cold arid region: An Agricultural perspective. In : Dynamics of cold arid agriculture. (Sharma, J.P. and Mir, M.S.Eds) Kalyani publishers. Kolkata. pp. 19-36.