

Red cherry pepper (Dalle khursani):

remunerative organic crop for doubling the farmers' income of Sikkim

Boniface Lepcha*, Manoj Kumar, J K Singh and R Laha

Krishi Vigyan Kendra, East Sikkim, Ranipool, Sikkim 737 135

Red cherry pepper (Capsicum annum var. cerasiforme) is one of the valuable cash crops of Sikkim. It is grown in almost every household in different cropping system, i.e. homestead cultivation, mono-cultivation and mixed cropping, etc. This chilli contains capsaicin which produces different pungency levels as well as carotenoids and phenolic compounds and is being used as natural pigment and antioxidant agents. However, the Scoville scale indicates that its pungency is very high and is in the range of 1,00,000–3,50,000 SHU. Fruit yield ranges from 80–150 q/ha with average productivity of 120 q/ha. The average net return of ₹10,25,000/ha results in very high benefit:cost (B:C) ratio of 6.8. Production efficiency and economic efficiency of red cherry pepper are recorded as 63.15 kg/ha/day and ₹5394.7/ha/day respectively.

Keywords: Economics, Red cherry pepper, Yield

RED cherry pepper (*Capsicum annum* var. *cerasiforme*) is one of the valuable cash crops of Sikkim. The crop is grown all over Sikkim since it is valued for its diverse commercial uses. Sikkim is well-known for unique, highly pungent chilli, locally known as Dalle khursani. It is perennial crop characterized by small to medium sized pods and fruits of different shapes, sizes and colours. Red cherry pepper of Sikkim has more medicinal properties and used for making pickle, paste, powder and dry chilli (for pickling chilli can be picked either at green or ripe stage). Moreover, its high flavour is the unique characteristic of this chilli (Table 1).

In Sikkim, the exact area and production of cherry pepper is not known, however, now under cluster farming in Sikkim, it covers an area of 284.13 ha. Out of the total area under cultivation, North Sikkim covers 17.05 ha, East Sikkim 79.25 ha, South Sikkim 115.83 ha and West Sikkim 72.0 ha. Presently, the fresh red cherry pepper fruits

are being lifted by Sikkim State Co-operative Supply and Marketing Federation Ltd, Sikkim supreme and MEVEDIR, Gangtok from the farmer's field. Farmers also sell their

Table 1. Morphological characters of red cherry pepper

Plant character	Morphological character
Stem colour	Dark green
Leaf colour	Green
Leaf shape	Ovate in shape
Flower	Pendant with creamy white corollas, often with a touch of light green
Annular constriction	Present below calyx
Anther colour	Blue
Filament colour	Purple
Fruit colour at maturity	Red
Fruit shape	Round, oblong
Fruit surface	Smooth
Seed colour	Light brown, light yellow
Hypocotyl colour	Green

produce at local retail market.

Brief package of practices (PoP)

Climate and soil: The crop can withstand high temperature but can not tolerate high rainfall during growth, flowering and fruit set. Ideal temperature for flowering is 20–25°C. It can be cultivated in wide range of altitude and soils but sandy loam soil with pH of 5.5–7.5 is ideal. Water stagnation is detrimental for the crop. Highly acidic soils need to be reclaimed using limestone or dolomite @1–2 t/ha.

Land preparation: The main field should be ploughed 2–3 times for fine tilth. Farmyard manure is added during the final bed preparation.



Land preparation



Nursery seedlings

During summers, planting should be done in the furrows while during rainy (*kharif*) season it should be done in ridges.

Nursery management: A low cost poly structure of size 12 m × 6 m is ideal for raised seedlings. Beds should be prepared by mixing FYM @2 kg/m² + neem cake @0.05 kg/m² + vermicompost @0.25 kg/m². About 400–500 g of seeds are enough for planting a hectare of land. Sowing the seeds 3–5 cm apart produces healthy seedlings. Treatment of soil with *Trichoderma harzianum* culture @10 g/m² 1 week before sowing manages soil borne diseases. Damping off is the most common disease which is managed by applying *Trichoderma viride* and *Pseudomonas fluorescens* culture @10 g/litre (Table 2).

Transplanting: Generally, 30–35-days-old seedlings are ready for transplanting. Seedlings should be kept in open condition 1 day before transplanting, allowing the



Farmyard manure application

Table 2. Organic soil nutrient management

Source	Dose	Application	Time
Farmyard manure	12.0 tonnes/ha	Soil	15 days before planting
Neem cake	0.50 tonnes/ha	Soil	7 days before planting
<i>Azospirillum</i> + Phosphate solubilizing bacteria (PSB)	200% (200 g/litre) root dip for 15 min	Seedling treatment	At planting
Vermicompost	2.5 tonnes/ha	Soil	20 DAP
Cow urine	20% (urine:water 1:4)	Soil drench	At 15 days interval

seedlings to acclimatize. For better establishment, seedlings should be transplanted in the evening. The optimal spacing of red cherry pepper is 0.9 m × 0.75 m with planting preferably done in raised bed. Before planting, roots should be treated with *Trichoderma viride* and *Pseudomonas fluorescens* @1% for 15 min to manage wilt problem. Water stagnation in the field can causes serious damage to crop so, proper drainage facility should be made. Shade should be provided with chilaune (*Schima wallichii*) twig to the individual plant during summers especially after transplanting.

Intercultural operations: Gap filling should be done during second irrigation, 10 days after transplanting. Light hoeing is required to loosen the soil for better aeration and root growth. In order to boost vegetative growth, fruit set and yield buds from first and second nodes are pinched off. Black polythene sheet is the most preferable mulching material for this crop.

Mulching techniques

- Very thin film (25 micron) can be used.
- Required length of film for one row of crop is taken and folded in *thaan* at every 1 metre along the length of the film.
- Round holes are made at the centre of the film using a punch or a bigger diameter pipe and a hammer or a heated pipe end could be used.
- One end of the mulch film (along width) is anchored in the soil and the film is unrolled along the length of the row of planting.
- Apply the required quantity of FYM and organic bio-fertilizer before mulching.



Use of plastic mulch in Dalle khursani

- Mulch film is then inserted (4–6 inch) into the soil on all sides to keep it intact.
- Seedlings are planted directly into the holes made on the mulch film.
- For mulching established seedlings, the process of punching the hole is the same. One end of the film along the width is buried in the soil and the mulch film is then unrolled over the saplings. During the process of unrolling, the saplings are held in the hand and inserted into the holes on the mulch film from the bottom side, so that it could spread on the topside.

Irrigation

Continuous supply of optimal water is essential for optimal plant growth and fruit yield. The first irrigation should be given immediately after transplanting and water should be provided at weekly interval in greenhouse planting. In drip irrigation the lateral pipelines are laid under the mulch film. In case inter-cultivation need to be carried out, it is better to keep the laterals and drippers on top of the mulch film and regulate the flow of water through a small pipe or holes made on the mulch film.

Economic benefits

The plant start flowering after 80–90 days of planting and first picking is done at ripening stage after 35–45 days of flowering (Table 3). Generally, 8–10 pickings are done every year. It continues to bear fruits for 2–3 years. Single fruit weight varied 4–6 g and it bears around 250–430 nos. of fruit per plant. The fruit yield varies 500–1500 g/plant,



Ripen fruits of Dalle Khursani

while picking, the fruits are lifted gently off the plant without causing injury or breakage of stem. Second year of plant gives more yield and after third year yield declines. Normally, fruit yield ranges from 80–150 q/ha with average productivity of 120 q/ha. Generally, off season fruits are being sold up to ₹450/kg but we have calculated its economics at the lowest rate of ₹100/kg. The average net return of ₹10,25,000/ha resulting in very high benefit: cost (B:C) ratio of 6.8. Production efficiency and economic efficiency of red cherry pepper were recorded 63.15 kg/ha/day and ₹5394.7/ha/day respectively. On the other hand, value addition of red cherry pepper fruits may fetch 2.8–3.2 times higher income than the price of fresh fruits being sold in the market which will be better option for doubling the income of farmers in Sikkim.

Major problems

Aphids: Aphids (*Aphis gossypii* and *Myzus persicae*) locally known

as Lye kira suck the sap and reduce plant growth and produce honey dew which attracts ants and develops sooty mould in the lower part of the leaves. They also act as vector for viral diseases. Application of systemic bio-pesticide, i.e. *Verticillium lecani*/petroleum based oil spray or neem based formulation (2000 ppm) @5 ml/litre of water sprayed 4–5 times at weekly interval will be effective to manage the aphid infestation problem.

Fruit fly: Fruit drops are main concern in red cherry pepper. This is because of fruit fly as well as plant nutrient competition among the fruits. Placing 8–10 pheromone traps per hectare at the time of fruit set and collection, and destruction of dropped fruits at regular interval manages the problem. The same control measures of aphids can be adopted to minimise the fruit fly problem.

Late blight: It is one of the diseases of red cherry pepper family (Solanaceous) crops worldwide, caused by the pathogen *Phytophthora infestans*. Late blight is favoured by high humidity, dew, wet weather and moderate temperatures (50–80°F). When the environment is favourable, the disease can spread quickly and can defoliate fields within 3 weeks. It can be managed by spraying of copper oxychloride (COC) @0.25–0.3%. Regular spray of *Trichoderma viride* or *Trichoderma harzianum* @1% can be adopted for the management of other diseases of this crop.

Constraints of production

- Higher labour charges are the major constraints for chilli

production. Due to increased opportunities in other sectors, labour force is shrinking day by day for agricultural sector, resulting in hike in labour charges.

- Non-availability of seeds, organic fertilizers and bio-pesticides in time in the local market is also a major constraint for chilli growers of the district.
- Lack of nearby market to sell the chilli and absence of transport facility to distribute the produce to the market are also contributing factors.
- Lack of proper processing and value addition facilities which restricts the farmers to produce at larger scale in the state.
- Lack of proper market intelligence of most of the chilli growers is also a major attributing factor of most problems.

SUMMARY

Red cherry pepper is selected as one district one crop for Gangtok district of Sikkim. Cultivation of this crop for small and marginal farmers is most productive and profitable option in Sikkim to get higher income. Red cherry pepper of Sikkim is a pungent chilli but has more medicinal properties. Organically grown red cherry pepper can be processed into a variety of products, viz. cherry pepper pickle and paste, dried cherry pepper powder and flakes. Pickles are most suitable for small scale manufacturers. When preserved properly they carry a low risk of food poisoning and have a long shelf life. Pickles can be made using relatively simple equipment that is readily available in most places. Hence processing of red cherry pepper has huge potential as remunerative enterprise/business. Chilli powders have their niche market both in India and globally. Hence, suggested for adoption by the farmers of mid-hills of Himalayan region for their livelihood improvement.

*Corresponding author's e-mail: yenob79@gmail.com

Table 3. Growth and yield attributes of red cherry pepper

Parameter	Data
Plant height (cm)	112.4
No. of shoots	4.2
Days for flowering	76.6
Days for fruit set from flowering	12.4
Days for fruit setting to maturity	42.8
Fruits/plant	278.3
Fruit length (cm)	3.4
Fruit width at shoulder (cm)	2.6
Fruit weight (g)	4.5
Seeds/fruit	32.6
1000–seeds weight (g)	43.7