weeds, facilitate better aeration and plant stand, and avoid water and nutrient competition.

Harvesting:

Harvest the crop when the heads are well developed and firm. The heads are cut with a knife having few non-wrapper leaves attached for safe transportation.

Plant protection:

Cabbage butterfly: The larvae are 3 cm long, green with black spots and yellow lines. They are very voracious, start feeding from margin of leaf to the centre and cause much damage especially in nursery.

Diamond back moth: The moth can be identified by white markings along the back of the forewings which when folded form diamond shape. The larvae are 1 cm long and light to brownish green colour. They attack lower surface of leaf and may also appear on upper surface.

Cutworm: The larvae are 3-4 cm long, gray-brown-blackish with various markings. They cause damage by biting into foliage of young plants, cutting down the stems just above the ground level and feeding on heads.

Aphid: Aphids suck the sap from leaves especially in late winter and spring season. The lower surface of leaves and the plant heart need special attention and must be well sprayed.

IPM

- Raise the mustard crop 25 days earlier to cabbage as trap crop for cabbage butterfly.
- Release of egg parasitoid, *Trichogramma chilonis,* @ 50000/ release/ ha at weekly internals from flowering at 4-5 times for cabbage butterfly and diamond back moth.
- Release of larval parasitoid, *Costesia plutellae,* @ 50000/ release/ ha at 50 days after transplanting for cabbage butterfly and diamond back moth.
- Spray BT formulations (Dipel, Halt) @ 2 g/ l of water for diamond back moth and cabbage butterfly.
- Spray NPV @ 250 LE/ ha in evenings at 30, 35 and 45 days after transplanting for cabbage butterfly and diamond back moth.
- Spray endosulfan or chlorpyriphos @ 2 ml/ l of water for cabbage butterfly, diamond back moth and cutworm.
- Spray imidachloprid @ 0.25 ml/ l water for aphid.

Black rot: The infection of foliage results in yellow 'V' shaped spots arising along the margin and extended to mid-rib.

Management: Use of tolerant cultivars, seed treatment with 0.1 % streptocycline, hot water treatment of seeds at 50 ^{0}C for 30 minutes and disinfection of seeds with organomercuric compounds (Thiram, Captan, Bavistin, etc.) @ 3 g/ kg seeds will manage the disease effectively.

Rhizoctonia rot: Young plants show soft, water-soaked spots on the stem just above ground and eventually fall over and perish.

Management: Disinfect the seeds before sowing with organomercuric compounds @ 3 g/ kg seeds.

Prepared by:

Dr B K Singh, Scientist (Hort.-Veg. Science)
Dr K A Pathak, Joint Director
Mr T Boopathi, Scientist (Agril. Entomology)
Dr Y Ramakrishna, Farm Manager (T6)
Mr Santosh Kumar, Research Associate

Published by:

Dr S V Ngachan, Director
ICAR Research Complex for NEH Region
Umroi Road, Umiam-793103, Meghalaya
Ph. No. 0364-2570257, Fax No. 0364-2570363

For further information please contact:

Dr K A Pathak, Joint Director
ICAR Research Complex for NEH Region
Mizoram Centre, Kolasib-796081, Mizoram
Ph. No. 03837-220041, Fax No. 03837-220560

Printed by :
print21, Ambikagirinagar, RG Baruah Road, Guwahati 24

Cabbage

Package of Practices for Cultivation in Mizoram

भाकृअनुप
ICAR

Technology Mission (MM-I)

भाकृअनुप-एरप
ICAR-RC-NEH

ICAR Research Complex for NEH Region
(ICAR)
Mizoram Centre, Kolasib-796081, Mizoram

Cabbage is one of the most popular and widely grown vegetables in Mizoram for its head and tender leaves, and has occupied first position in production (3684 t) and second in area (236 ha) with a productivity of 15.6 t/ ha. Besides, having good tonnage capacity, it is a rich source of essential and sulphur containing amino acids, minerals, β-carotene and ascorbic acid. It has been reported to have anti-carcinogenic properties.

Hybrids and varieties:

Selecting the best hybrid and variety is critical for success. Both hybrids and high yielding varieties are suitable for cultivation in Mizoram (Table 1)

Table 1: Yield potential of hybrids/ varieties

Varieties/ hybrids	Yield potential (q/ ha)
Golden Acre (variety)	300-350
Pusa Mukta (variety)	250-300
Pride of India (variety)	300-325
Pusa Ageti (variety)	280-325
Pusa Drum Head (variety)	300-375
Blue Diamond (hybrid)	475-525
Bahar (hybrid)	450-500
Harnil (hybrid)	450-500
Quisto (hybrid)	400-450

Climate:

Cabbage grows best in temperatures 15–20 °C. The heading is poor when average temperature exceeds 25 °C. It is grown mainly in winter season in Mizoram.

Soil:

It prefers light, well-drained and fertile soil having pH of 6.0–6.5. Liming is recommended in acidic soil @ 1-2 t/ ha.

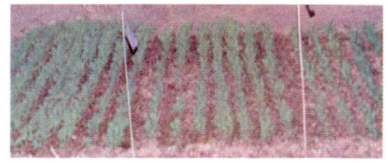
Seed rate:

Hybrid: 250-400 g/ ha
Variety: 350-500 g/ ha

Time of transplanting:

The best time for transplanting is 1st week of November to 1st week of December. Raise the seedlings 4-5 weeks before transplanting.

Nursery raising:



Well-drained area not recently cultivated with cruciferous crops is the best suited for raising nursery. Burning a 3–4 cm layer of grass straws on the bed before sowing and preparation of raised nursery-bed of 15 cm or higher to reduce the incidence of soil-borne diseases. The nursery-bed should be prepared by addition of well rotten FYM @ 4-5 kg/ m^2. The width of the nursery bed should be kept 75-100 cm and length as per the need and availability, preferably 5 m. Drench the nursery-bed with dithane M-45 @ 2 g/ l water to reduce the incidence of damping-off disease. Sow the seeds in rows 6-8 cm apart at a rate of 750-850 seeds/ m^2. Cover the bed surface with a thin layer of mixture of sand, soil and FYM. Water the nursery-bed regularly with water-can and do not allow the soil to dry and form a crust on the surface that might hinder seedling emergence. The nursery-bed should be protected from heavy rains either by cladding overhead thatch or plastic sheet. Pick the larvae and spray chloropyrifos @ 3 ml/ l water to manage cabbage butterfly in nursery. Weeding and intercultural operations should be done regularly.

Transplanting:

Harden the seedlings by slightly reducing watering and exposing them directly to sunlight 5-8 days before transplanting and finally water the seedlings about 12 hours before transplanting to the main field. The vigorous, stocky and 4-5 weeks' old seedlings along with 4-5 leaves are good to transplant in field. Evening transplanting is recommended to avoid heat stroke. Insert the seedling in a hole, press the soil firmly around the root and water around the seedlings. Hardening and evening transplanting is recommended to avoid transplanting shocks for better establishment.

Spacing:

The spacing of plants depends upon soil type, fertility, plant vigour and time of transplanting. We are generally following the spacing of 50 × 40 cm at ICAR Kolasib.

Manure and fertilizers:

Well rotten FYM or compost @ 12 t/ ha and lime @ 2 t/ ha is incorporated in the soil during land preparation. Besides lime and FYM, the crop should be fed with N:P:K @ 100:60:40 kg/ ha to produce good crops. Half dose of nitrogen and full doses of phosphorus and potash should be applied as basal dressing at the time of transplanting. Remaining nitrogen is side-dressed either just before start of heading or 40-50 days after transplanting.

Mulching:

A 5 cm thick mulch of locally available dry grasses or other organic material is used to cover the soil surface just after plant establishment. Mulch reduces weed growth, fertilizer leaching; avoids soil compaction; conserves moisture up to 60 %; promotes soil aeration and plant growth; and eventually increases the crop productivity by 15-25 %.

Irrigation/ watering:

Cabbage is sensitive to water deficit after transplanting and during heading. Irrigate the crop at 7-10 days interval or need based until head formation.

Weeding and intercultural operations:

Post-planting care with one weeding/ hoeing in mulched field and 2-3 weeding/ hoeing and an earthing-up in non-mulched field is recommended to control the