

RAPESEED AND MUSTARD

Rapeseed (*Brassica campestris*) and Mustard (*Brassica juncea*) are the major *rabi* oilseed crops of India. India is one of the largest producer of these crops in the world. The production of rapeseed and mustard in India accounts for about 18% of the total oilseed production of the country. Sarson and *toria* (lahi) are generally termed as rapeseed, rai or raya or laha is termed as mustard. The seed and oil are used as condiment in the preparation of pickles and for flavouring curries and vegetables. The oil is utilized for human consumption throughout northern India in cooking and frying purposes. The oil cake is used as a cattle feed and manure. Green stems and leaves are a good source of green fodder for cattle. The leaves of young plants are used as green vegetables as they supply enough sulphur and minerals in the diet.

The oil content of the rapeseed and mustard ranges from 30 to 48 percent. The crop is grown both in subtropical and tropical countries. Among the *rabi* oilseeds, rapeseed and mustard can play an important role in the north eastern hill region to boost oilseed production. In the region, rapeseed-mustard can be successfully grown as *rabi* crop up to mid altitude (<1300 m msl) and yield level of 8-12 q/ha can be achieved by adopting improved production technology.

In NEH region, rapeseed - mustard is cultivated in an area of 0.46 lakh ha and the average yield is 888 kg/ha, which is much lower compared to the national average (941 kg /ha). The low productivity is primarily due to untimely sowing, poor crop stand, inadequate nutrition, moisture stress and almost no plant protection measures. The problems get further aggravated when the crop is cultivated on marginal land under rainfed conditions



Photo – Mustard in field and terraces

Climate

Rapeseed and mustard are crops of tropical as well as temperate zones and require somewhat cool and dry weather for satisfactory growth. They require a fair supply of moisture during the growing period and a dry clear weather at the time of maturity. Cool temperature, clear dry weather with plentiful of bright sun shine accompanied with adequate soil moisture increases the oil yield. In India they are grown in Rabi season from September-October to February-March. *Toria* is more liable to suffer from frost and cold and is, therefore, usually sown earlier and harvested before the onset of frost. Rape seed and mustard are long day crops in photo-periodic response. These crops are not drought tolerant. They require an annual precipitation of 350-450 mm.

Soil

Rape seed and mustard are capable of growing under a wide range of soil conditions varying from sandy loam to clay loam soils but they thrive best on light loam soils. They neither tolerate water logging conditions nor do well on heavy soils. Plants can tolerate moderate salinity reasonably well but a soil having neutral pH is ideal for their proper growth and development.

Varieties

ICAR Research Complex for NEH Region has developed four yellow sarson lines viz. TRS –Y-01-5-1-1 (1.6 t/ha), TRS –Y-01-2-2-1 (1.3 t/ha), SCRT 1-2-1 and SCRT 1-2-3 (1.64 t/ha).

State-wise major varieties of mustard & rapeseed

State	Cropping systems
Meghalaya	M-27, TS-36, TS-46
Manipur	M-27, TS-36
Mizoram	Kranti, TS-36, TS-46
Nagaland	TCN-42, M-27, TS-38
Sikkim	Sikkim Sarson, M-27, Kranti
Tripura	TM-6, Kranti, M-27, TS-38

Cropping Systems

Generally in the NEH region, the rainfall ceases in the last week of September and moisture stress starts after November, which is not suitable for taking *rabi* crop. If short duration varieties of rapeseed and mustards, which mature in 90-100 days, are sown after harvest of upland rice and maize, not only the cropping intensity would be increased but the production of oilseeds also will be increased. Under high moisture condition in low, wet and marshy lands where *rabi* crop is not possible due to excessive moisture, the permanent or temporary raised and sunken beds opens up new vistas for growing any crop including oilseeds during *rabi* season.

The inclusion of rapeseed and mustard in cropping systems on raised beds increase the production and productivity of oilseeds. The adoption of intercropping system on raised bed although decreased the productivity of individual crop but overall system productivity increases markedly.

The following cropping systems have been identified for the NEH region -

(a) Mid and low altitude (a) Dry upland terraces

- Maize-mustard,
- Maize + French bean-mustard
- Rice – mustard, French bean - mustard
- Groundnut – mustard

(b) Marshy/lowland/wetland conditions (raised beds)

- Maize-mustard,
- Rice-mustard
- Rice-mustard-tomato,
- Rice-mustard-potato
- Groundnut- mustard

(c) Intercropping on raised beds

- Cabbage + mustard,
- Broccoli + mustard
- Coriander + mustard

Field Preparation

A clean and well pulverised seedbed of good tilth is needed for better germination. The land should be well prepared first by ploughing deep with soil turning plough, followed by two cross harrowing. Each ploughing should be followed by planking so that the soil is well pulverised and levelled. Care should be taken to see that weeds and stubbles are removed from the field and the soil contains adequate moisture to ensure good germination.

Zero tillage cultivation of toria after rice and maize is a viable proposition which saves time, energy and reduces cost of cultivation. Immediately after rice harvest, a narrow furrow should be opened in between two rice rows with the help of furrow opener and the manure should be applied and the sowing of seeds should be undertaken followed by covering of the seeds.



Photo – Mustard Flower

Seed and Sowing

a. Time of sowing

Planting time is the single most important variable affecting the seed yield of rape seed and mustard to a great extent. Since the rate of development of oil in seed is greatly influenced by the variation in atmospheric temperature, humidity, and other biotic factors, sowing either too early or too late have been reported to be harmful. Delay in planting reduces the yield on account of its depressing effect on the plant growth, flowering duration, seed formation and seed size. Therefore, for getting good yields of rape and mustard timely sowing is a must. *Toria* should be sown from the mid to the last week of September. If sowing of *toria* is delayed, there is great danger of attack of aphids on the crop. Sowing of sarson and rai must be completed in the first fortnight of October.

b. Seed Rate and Spacing

Spacing has no absolute value in the cultivation of rape and mustard as it fluctuates a great deal with the growth habit of variety, date of sowing, manuring and irrigation practices. Generally *toria* is planted in rows 30 cm apart while sarson and rai are sown in rows 45 cm apart. Thinning is done three weeks after sowing to maintain a plant to plant distance of 10 to 15 cm. In case of mixed cropping they are generally sown in rows 1.8 to 2.4 metres apart in the main crop, 5 to 6 kg seed should be sown in rows at a depth of 2.5-3.0 cm in case of a pure crop. When sown mixed with some other crop, 1.5 to 2 kg seed per hectare is sufficient. Sowing could be done either behind the local plough or through seed drill.

Manures and Fertilizers

Apply 10 tonnes of farm yard manure or vermicompost @ 5t/ha during last field preparation along with 150 kg rock phosphate.

Water management

Normally, no irrigation is required in the rapeseed-mustard as it is sown on residual soil moisture and it receives one or two showers during October and November months. However, in case of moisture stress, one irrigation at flowering is required to obtain good yield. Irrigation increases yield of rapeseed and mustard significantly. In agro-climatic conditions of Meghalaya, irrigation at 0.3 IW/CPE ratio produced significantly higher seed yield followed by 0.6 IW/CPE ratios. Flowering and siliqua formation stages are critical stages for irrigation in rapeseed and mustard. Two irrigations at pre-bloom and pod filling stages are beneficial.

Weed management

Weeds in rape and mustard crop cause approximately 20-30 percent reduction in yield. Care should be taken to remove all weeds in the early stages of crop growth to avoid competition on the reserve of moisture. One inter-cultural operation with hand hoe is very beneficial. This, besides creating soil mulch also reducing moisture losses through evaporation and helps in better growth and development of crop plants. Thinning operation helps in better growth and development of crop plants. Thinning operation should be accompanied with inter-culture to provide the plants proper space within the rows. Major weeds observed in rapeseed and mustard field are *Bidens pilosa*, *Ageratum conyzoides*, *Chenopodium album*, *Euphorbia hirta* etc. Hand weeding at 30 and 60 days after sowing has recorded maximum seed yield.

Mulching

Under Meghalaya condition, mulching with rice straw resulted in increase in mustard seed yield significantly. Mulching helps in conserving soil moisture, reduces weed problems and maintains soil temperature. Mulching with thin black polythene film gave highest seed yield compared to other mulch at Umiam, Meghalaya.

Plant protection

The most serious insect-pest of mustard is aphids. While white rust and Alternaria blight are two important diseases of rapeseed and mustard in the region. Symptoms and management practices for insect pest management and diseases are as follows:

1. Mustard aphids (*Lipaphis erysimi*)

Symptoms – Both nymphs and adults suck the sap from leaves, buds and pods. Curling may occur in infested leaves and at advanced stage plants may wither and die. Plants remain stunted and sooty moulds develop on the honey dew excreted by the insects. The infected field looks sick and blighted in appearance.



Photo – Mustard Aphids

Management –

Cultural – Use tolerant varieties, Early planting to escape the damage and use of yellow sticky traps.

Biological – Release, protection and promotion of beneficial insects such as, ladybird beetles viz., *Coccinella septempunctata*, *Menochilus sexmaculata*, *Hippodamia variegata* and *Cheilomonas vicina* are most efficient predators of the mustard aphid. Adult beetle may feed an average of 10 to 15 adults/ day. Several species of syrphid /hover fly i.e., *Sphaerophoria* sp., *Eristalis* sp., *Metasyrphus* sp., *Xanthogramma* sp and *Syrphus* spp. The braconid parasitoid, *Diaeretiella rapae*. The lacewing, *Chrysoperla zastrowisillemi*.

Control measure – 2-3 spray of soft soap or insecticidal soap as soon as the aphids start appearing. 2% neem oil or 5% NSKE is also very effective in aphids management. Foliar spray of *Verticillium lecanii* @ 5 gm/ lit of water. In severe infestation garlic-chilly extract with 2% neem oil and liquid soap is very effective.

2. Painted bug (*Bagrada hilaris*)

Symptoms – Both nymphs and adult suck sap from leaves and pods which in due course wilt and show symptoms of withering. Adult bugs secrete gummy substance which spoil the pods.

Management

Cultural – Deep ploughing. Early sowing helps in avoiding the pest attack. Irrigation during first 4 weeks also help in its management. Bugs generally congregate on leaves and stem. By jerking the plants and leaves bugs can be dislodged and collected from ground for destruction. Burn crop remains of infested field to destroy eggs and other stages to prevent their spread in next year's crop.

Biological - Conserve and promote egg parasitoid *Gryon sp.* (Scelionidae) and the adult parasitoid *Alophora sp.* (Tachinidae).

Control measures – Seed treatment with cow urine and garlic-clove-cinnamon extract help in managing bug during initial growth phase. Prophylactic spray of neem+karanj oil with insecticidal soap through pressure jet on leaves and stem also help in control of pest.

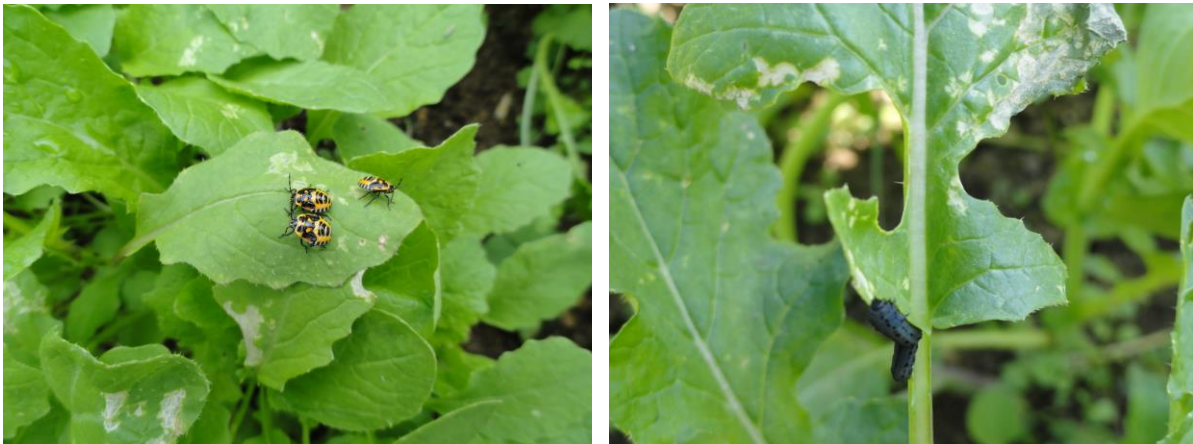


Photo – Painted bug (left) and Saw fly (right)

3. Mustard Sawfly (*Athalia lugens proxima*)

Symptoms - In initial stages of infestation larva nibbles leaves, later as it grows it start feeding the leaves from margins towards the midrib. Numerous shot holes

are visible, sometimes the entire leaves gets riddled by voracious feeding. Grub prefer epidermis of the shoot, resulting in drying up of seedlings and failure to bear seeds in older plants.

Management

Cultural - Summer ploughing to destroy the pupa. Early sowing helps in avoiding the pest problem. Maintain clean cultivation. Give irrigation in seedling stage is very crucial for sawfly management because most of the larvae die due to drowning effect. Severe cold reduces pest load. Collection and destruction of grubs of saw fly in morning and evening

Biological - Conserve *Perilissus cingulator* (parasitoids of the grubs), Foliar spray of pathogenic bacteria *Serratia marcescens* which infect the larvae of sawfly.

Control measure - Foliar spray of bitter gourd seed oil (5%) can effectively manages the sawfly.

4. White rust/ Downy mildew (*Albugo candida*)

Symptoms – White, creamy pustules emerge on the stem, twig and leaf surfaces. In systemic infection such white rusty pustules emerge on all parts of the body and induce hypertrophy (abnormal enlargement of cells). In secondary local infection white rusty pustules emerge on leaf, stem and inflorescence and give powder coated appearance.

Management

Cultural – Use disease free, healthy seed, Destroy weeds which act as collateral host, collect and destroy infected plant parts. In cases of consistent problem areas adopt 3-4 years long crop rotation with non-host crops.

Control measures – Seed treatment with freshly prepared garlic bulb extract. Alternatively seeds can also be treated with garlic-clove-cinnamon extract. Foliar spray of Bordeaux mixture (1%) or copper oxychloride (0.3%) can also manage the pest.



Photo – White rust (left and Alternaria leaf spot (right)

5. Alternaria leaf spots (*Alternaria brassicicola* and *A. brassicae*)

Symptoms – Dark coloured leaf spots with concentric rings emerge. Spots of *A. Brassicicola* are larger in size while that of *A. Brassicae* are small in size. Leaf tissue dries up and drop-off, leaving big irregular holes.

Cultural – Maintain field sanitation, Adopt 3-4 years long crop rotation with non-host crops. Early sowing escapes the infection

Control measures – Seed treatment with hot water (50°C) or with freshly prepared garlic bulb extract. Alternatively seeds can also be treated with garlic-clove-cinnamon extract. Foliar spray of copper oxychloride (0.3%) at an interval of 15 days from 45 days after sowing can effectively manage the pest.

Harvesting and Threshing

As soon as the pods turn yellowish-brown, harvest the crop. Normally, the crop is ready for harvest after 90 - 105 days of sowing. Preferably, harvesting should be done in the morning hours to avoid shattering loss. The crop is liable to shattering, hence it should be harvested just before the pods open in order to avoid losses. Sarson is less liable to shattering as compared to toria and mustard. Crop is harvested with the help of sickles. The harvested crop should be stacked in threshing floor for five to six days before threshing. Threshing is very easy with the help of sticks. The pods easily shatter and give away seeds. Threshing could be done with bullocks or tractor. The threshed grain is separated from the husk with the help of slow moving natural air current. Cleaned seed must be dried in the sun for four to five days or till the moisture content comes down to 8 percent.

Yield

With the use of improved varieties, agronomical and plant protection techniques, the farmers may expect to harvest a seed yield of about 10-15 q/ha.



Photo – Mustard seeds