

Scientific cultivation of *kharif* onion

Onion (*Allium cepa* L), an important commercial bulb vegetable crop, comes under family Alliaceae. It has originated in central Asia and is extensively cultivated all over the world, mainly in China, India, Netherlands, Pakistan, Bangladesh and Australia. India is the second largest producer of onion. As per monthly report of the Horticulture Statistics Division, Department of Agriculture, Co-operation and Farmers Welfare, Government of India, New Delhi (March, 2020) the total onion production of India is 228.19 lakh tonnes out of which share of *kharif* onion is 48.41 lakh tonnes, late *kharif* onion 21.50 and *rabi* onion 158.28 lakh tonnes. The major onion producing states in India are Maharashtra, Madhya Pradesh, Karnataka, Rajasthan, Bihar, Gujarat, Andhra Pradesh, Haryana, West Bengal and Uttar Pradesh. *Kharif* onion is mainly grown in Maharashtra, Karnataka, Gujarat with new emerging areas in parts of Madhya Pradesh, Rajasthan and Uttar Pradesh. These states account for almost 90% of the total onion production of the country. Maharashtra is the largest producer of onion with about 8,047 thousands tonnes having share of 35.26% in 2018-19.

IN India, onion is produced in three seasons i.e. *kharif*, late *kharif* and *rabi*. About 21.21% production comes from *kharif* crops. The *kharif* onion is transplanted during July to August and probably harvested during October to November. The major portion of the *rabi* season onion crop can be stored throughout the India. This stored onion becomes available during May to October but there may be critical gap in supply of onion during October to December in the country. So the *kharif* onion crop plays key and vital role in fulfilling consumers' demand in the country and hence, there is a need to popularize *kharif* onion cultivation which will also help to regulate the onion prices.

Soil

Soils for onion cultivation should be light, deep friable and highly fertile. Sandy soil needs more and frequent irrigation along with additional supplement of FYM or compost. In general, sandy loam to clay loam soil is more suitable. The optimum pH range required is between 6.0 and 7.5. Highly alkaline and saline soils are not suitable for onion cultivation. Addition of well decomposed organic manure helps in improving fertility status of soil besides improving the soil physical conditions and availability of microorganisms. Onions are very much sensitive to the effects of high water table, so well drained soils are best.

Selection of suitable onion varieties for *kharif* season

An ideal variety should have characters like early bulking, thin neck, resistance to pest, diseases and tolerance to water logging. Generally variety having 90

to 105 days duration with thin neck is to be preferred for *kharif* season. Some suitable varieties of *kharif* onion are as below.

Agrifound Dark Red: This variety, developed by National Horticultural Research and Development Foundation (NHRDF), is very old. It is recommended as *kharif* variety in all over the country.

Arka Kalyan: This variety, developed through vigorous mass selection from ICAR-IIHR, Bengaluru, is also among old variety suitable for *kharif* season.

Baswant -780: *Kharif* and late *kharif* variety was developed by Mahatma Phule Krushi Vidyapeet, Rahuri, Maharashtra.

Bhima Dark Red: This variety was developed by ICAR-DOGR, Rajgurunagar, Pune, Maharashtra. It is recommended as *kharif* variety for Gujarat, Maharashtra, Rajasthan, Delhi, Haryana, Karnataka, Madhya Pradesh, Tamil Nadu and Punjab.

Bhima Raj: Variety developed by ICAR-DOGR, Rajgurunagar, Pune, Maharashtra. It is recommended as *kharif* and late *kharif* variety for Gujarat, Maharashtra and Rajasthan and as *rabi* for Delhi, Gujarat, Rajasthan and Haryana.

Bhima Red: Variety developed by ICAR-DOGR, Rajgurunagar, Pune, Maharashtra, is recommended as *kharif* variety for Gujarat, Maharashtra, Rajasthan, Delhi, Haryana, Karnataka, Madhya Pradesh, Tamil Nadu, Punjab and as *rabi* for Maharashtra and Madhya Pradesh.

Bhima Safed: It is recommended for *kharif* season for Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and Tamil Nadu.



Baswant 780



Phule Samarth



Bhima Dark Red

Bhima Shubhra: The variety was developed by ICAR-DOGR, Rajgurunagar, Pune, Maharashtra, is recommended for *kharif* season for Chhattisgarh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Rajasthan and Tamil Nadu. It can be also cultivated during late *kharif* season.

Bhima Shweta: This variety was developed by ICAR-DOGR, Rajgurunagar, Pune, Maharashtra. It is recommended as *kharif* variety for Chhattisgarh, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh, Odisha and Tamil Nadu and as *rabi* for Andhra Pradesh, Bihar, Chhattisgarh, Delhi, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Uttar Pradesh and Punjab.

Bhima Super: Variety developed by ICAR-Directorate of Onion and Garlic Research (DOGR), Rajgurunagar, Pune, Maharashtra, is recommended as *kharif* and late *kharif* variety for Delhi, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Punjab and Odisha.

Line-883: This variety was developed by National Horticultural Research and Development Foundation (NHRDF). It is a recommended as *kharif* and early *kharif* variety in all over the country.

N-53: It is very old *kharif* variety developed by Agriculture Department of Maharashtra, but now breeder seed is not available.

Phule Samarth: A *kharif* and late *kharif* variety developed by Mahatma Phule Krushi Vidyapeet, Rahuri, Maharashtra.

Pusa Riddhi: This variety was developed by IARI, Delhi. It is suitable for *kharif* and *rabi* crop storage and export.

Nursery management and transplanting

Well drained sandy loam soil rich in organic matter with sufficient land slope is preferred for nursery raising of *kharif* crop onion. Water stagnation during nursery stage in *kharif* season favours fungal diseases infection. The land should be prepared well in advance with repeated ploughing and harrowing to obtain a fine tilth. Areas where nursery is severely affected by damping off or soil borne diseases needs soil solarization treatments. Such nursery area should be irrigated lightly and covered with 200 gauge transparent white polythene during March to May where soil temperature rises up to 50°C for about 6-7 weeks. After 6-7 weeks, polythene sheet cover is to be removed and prepare the beds for *kharif* onion crop nursery. For raising nursery, raised bed of about 2-3 m

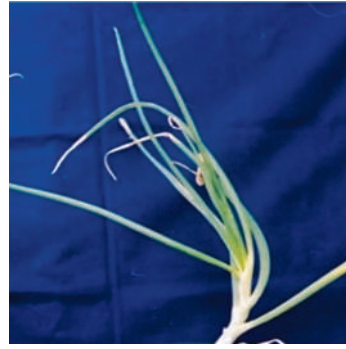
length, 1-1.5 m width and 15-20 cm height to be prepared. Apply 8-10 kg well decomposed farmyard manure (FYM) and 150 g 19:19:19 (NPK fertilizer) and copper oxychloride at 50 g per bed at the time of bed preparation and mix well with soil or apply well decomposed farmyard manure (FYM) @ 1 kg, 0.5 g nitrogen, 5 g phosphorus and 5 g potassium per m² area as basal dose and rest 0.5 g nitrogen per m² area is to be top dressed at 20 days after sowing. *Trichoderma harzianum* (30 g) is to be applied into the bed through well decomposed organic manures or application of *Trichoderma* @ 1.25 kg/ha is also recommended to manage damping off and raise healthy seedlings. Raised bed is recommended for nursery because as in case of the flat bed, water moves from one end to the other and there is a possibility of washing away of seeds as well as water logging in heavy soils. In sandy soils, however, sowing can be taken up in flat beds. For transplanting one hectare area, about 8-10 kg seed is required for nursery raising. If the nursery is raised using drip or sprinkler irrigation system, the seed rate of about 5-7 kg/ha is sufficient. Before sowing, the seeds are to be treated with captan or carbendazim @ 2-3 g/kg of seed. Treated and packed seeds do not require treatment again. The seed should be sown into line with spacing of about 5 to 7.5 cm in the lines at depth of 1-1.5 cm. The seeds after sowing to be covered with fine powdered farmyard manure or compost followed by light watering. Then the beds should be covered with dry straw to maintain optimum temperature and moisture. Watering should be done by a water can as per the need till germination is completed in small areas. In case of bigger areas it can be irrigated through flood if drip or sprinkler is not available, by filling the water in canals on both sides of the nursery raised beds. Nursery of onion can also be successfully raised on drip or sprinkler irrigation on raised beds. Dry straw or grass to be removed immediately after germination is completed in about



Onion seedling ready for transplanting



Fe deficiency



Zn deficiency



Mn deficiency

transplanted on raised bed. About 40-45 days age old seedlings should be transplanted in the main field at spacing 15 × 10 cm. Seedlings of 0.8-0.9 cm in stem diameter and 20-35 cm height are optimum for transplanting. One third top portion of the seedlings is to be cut at the time of transplanting.

6 to 8 days after sowing. Delay in removal of dry straw and grass may result in lanky growth and yellowing of seedlings. Two hand weeding found effectively controlling the weed population in onion nursery during *kharif* season. In case of weedicide, it is advised to spray only pendimethalin @ 2 ml/l of water before onion seed germination followed by hand weeding at 20-25 days after sowing. The nursery should be protected by green shed net (above 2 m height) during hot summer and rainy season. Onion seedling in nursery can be attacked by different insect pests and diseases. So some control measures are to be taken for getting healthy, pest and diseases free seedlings. Thrips is a major pest of onion. Spray with fipronil 5 SC @ 1 ml/l of water or carbosulfan 25% EC @ 2 ml/l of water is effective to control thrips. Sticker is to be used during rainy season. Cloudy weather and dew formation favours fungal diseases like root rot, damping off, wilt etc. Spray the seedlings with mancozeb @ 2.5 g or hexaconazole 1 g/l of water to control black and brown blight diseases. Stagnation of water and inadequate drainage favours seedling root rot (fungal disease) in nursery. Root rot can be controlled by drenching of copper oxychloride @ 3 g/l of water. Drenching of metalaxyl 4% + mancozeb 64% @ 2 g/l of water between the rows controls wilt and damping off fungal diseases. Seedling may become yellow due to heavy nutrient loss through leaching therefore, foliar spray of 19:19:19 and micronutrients mixture (Zn 3%, Fe 2.5%, Mn 1%, Cu 1% and B 0.5%) at 20 days after sowing as per the recommended dose or scientists advise can control the deficiencies.

Kharif (rainy) season onion crop should be always

Over-aged seedlings if planted results in more bolting, more double bulbs, thick neck bulbs or small size bulbs. In case of younger seedlings, establishment seems poor. It is recommended for dipping of onion seedling roots into solution of fungicide carbendazim @ 1 g/l of water and insecticide carbofuran @ 2 ml/l of water before transplanting for 2 h to control pest and diseases. The duration of seedlings root dipping may be changed as per recommendations of State Agricultural Universities and can be confirmed by the experts.

Nutrient management

Ideal nutrient requirement depends upon soil type, available nutrient status of the soil and removal of nutrients by crop, *etc.* A nutrient management practice differs as per soil nutrient availability status. For normal



Oxyfluorfen 23.5% EC @ 1 ml/l of water with quizalofop ethyl 5% EC @ 1 ml/l of water @ 25 DAT +1 hand weeding at 45 DAT.



Oxyfluorfen 23.5% EC at 1-1.5 ml/l of water at transplanting + 1 hand weeding at 30 DAT



Control (without weed management practices)



Weed management practices affects onion bulb size (T₇ with weed management; T₈, control).



Onion harvesting and cutting

soil, well decomposed organic manure @ 25-30 t/ha to be incorporated into the soil 15 days before transplanting. Application of 250 kg neem cake per hectare can be applied as basal. Biofertilizers viz. *PSB*, *Azotobacter* @ 5 kg/ha each and *Trichoderma* 1.25 kg/ha can be applied through well decomposed organic manure or biofertilizers in liquid form can be preferred for easy application through drip irrigation. Bio-agents should not be used with chemical fertilizers or any agrochemicals. As per normal soil nutrient availability status, NPK @ 100:50:50 kg/ha is to be applied. First dose of NPK @ 50:50:50 kg/ha is to be given at the time of transplanting whereas remaining N @ 50 kg/ha to be given in 2 or 3 equal splits at 30 and 45 or 30, 40 and 50 days after transplanting, respectively. Sixty days after transplanting, no nitrogen containing fertilizers should be applied. Apart from major nutrients application through soil application, water soluble fertilizers and micronutrients can be given to enhance growth and yield in onion crop. About 30 and 45 days after transplanting (DAT), 0.5-1% spray of 19:19:19 (NPK) and one spray of 0.5-1% 13:00:45 or 00:00:50 during 60 DAT can give good results. If soils are deficient in micronutrients and plant show deficiency symptoms of particular micronutrients then particular micronutrients to be given as correction measure. Foliar application of micronutrients mixture (Zn 3%, Fe 2.5%, Mn 1%, Cu 1% and B 0.5%) to be done at 30 and 45 days after transplanting based on soil test reports or when plant show deficiency symptoms.

Weed management

As onion plants are closely spaced and shallow rooted

it is essential to keep the crop weed free, especially 30-45 days from transplanting. Crop weed competition is recorded higher from transplanting till almost 45 days, it may reduce yield up to 60%. Application of weedicide oxyfluorfen 23.5% EC @ 1.5 ml/l of water before transplanting or 8-10 days after transplanting using flat nozzle sprayers followed by one hand weeding at 30 days after transplanting efficiently controls weeds in onion.



Harvested onion bulbs

Spray of oxyfluorfen 23.5% EC @ 1 ml/l of water with quizalofop ethyl 5% EC @ 1 ml/l of water at 25 days after transplanting followed by one hand weeding at 45 DAT can also give good results.

Harvesting

In *kharif* season, since tops do not fall, bulbs are harvested soon after the colour of leaves changes to slightly yellow and tops start drying and red pigmentation on bulbs develops. Developed true shape bulbs to be harvested and kept for drying the tops. The leaves are cut leaving about 2-2.5 cm tops above the bulb after complete drying. In *kharif* season, late harvesting results in doubled bulbs and bolting. The average yield of 10-15 t/ha can be obtained in *kharif* onion crop.

For further interaction, please write to:

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