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Scope of onion seed production in Raichur district of Karnataka: A review

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Abstract
Onion is grown widely in different parts of the country. It is important foreign exchange earning crop to the country. India produces around 168 lakh tons of onion annually ranking second in the world. The production has increased more than five times during past three decades. The reason for an increase in production is mainly due to increase in area under onion cultivation from 1.94 lakh ha during 1974-75 to 10.51 lakh ha in 2012-13. India possesses many innate advantages over other onion producing countries - its large genetic base, varied soil and climatic conditions and skilled human power. So many farmers are involved in the traditional onion seed production in Raichur district, Karnataka state. They are producing seeds with less cost and getting higher returns from the onion seed marketing to neighbour farmers.

Keywords: Onion, Seed Production, Direct sowing and Seed yield

1. Introduction
Onion (*Allium cepa* L.) is one of the important commercial vegetable crop grown in India. It is widely grown in different parts of the country mainly by small and marginal farmers. It is used as a salad or cooked in various ways in all curries, fried, boiled or baked. It is also used in processed forms *e.g.* flakes, powder paste, pickles *etc*. It has very good medicinal value. Nutritive value of onion varies from variety to variety. Small size onions are more nutritive than big ones. Its major value is in its flavour. Onion ranks medium in calorific value, low in protein and very low in vitamins. The high demand of onions within the country and for the export has made it essential to supply onions round the year either from fresh harvest or from stock.

Among the different onion growing states, Maharashtra tops in an area and production, followed by Karnataka, Madhya Pradesh and Andhra Pradesh. Maharashtra has highest share both in area (24.73%) and production (27.72%). However, the productivity is still low. Poor soil fertility, use of low level of inputs like manures, fertilizers and crop protection chemicals, high labour cost and crop loss due to diseases, lack of resistant varieties and postharvest losses are the major reasons for low productivity.

Medicinal value
The compound is allyl propyle disulfide, sometimes called allyl sulfide. It contains 43.6 per cent sulphur. Some varieties (more pungent) show more than twice as much volatile sulphur as others. Red colour of onion is due to anthocyanin while yellow due to quercetin.

Onion production sometimes hampers due to the scarcity of seed. A lot of work has been conducted on onion bulb production but a little information is available on quality onion seed production. The reasons for lower productivity of onion in India could be attributed to the limited availability of quality seed and lack of development of hybrids in onion is the major limiting factors among the others.

Status of requirements and supply of quality seed of onion in India
The estimated requirement of quality seed of onion is 3120 t (assuming seed rate 6 kg/ha) during 2002 and out of that only 9.6% of the demand is catered by public sectors organizations *viz*; NHRDF, NSC, ICAR institutes (IARI &, IIHR) and SAU's). The most of the demands of the quality seed were either meet by private sectors or unorganized program or own saved seed. Therefore, it becomes important to increase the supply of quality seed through the efficient use of the technology. On the other hand, sincere efforts should be made for the development and release of hybrids.

Floral biology and pollination in Onion

Anthesis occurs in early morning (6-7 hrs). Anther dehiscence is between 7.00 and 17.00 hr and on next day also with peak between 9.30 and 17.00 hr. Pollen fertility is highest on the days of anthesis. Stigma receptivity is also high on the day of anthesis (Jones, 1933) [6]. The duration of anthesis is approximately 4 weeks on individual umbel. The anthesis begins from outer flowers and goes centerally in succession. The flower is protandrous in nature and stigma becomes receptive when shedding of pollen is over (Fig.1). Onion is cross- pollinated in nature and bees, flies and other insects do pollination. It is essential to ensure that there is sufficient population of pollinating insects to achieve the full potential of onion seed. It is also possible in some situation to encourage the development of increased blowfly population by distributing suitable carrier or dried fish among the flowering crop (Currah and Proctor, 1990) [4].

Fig 1: Floral biology and protandrous nature

Methods of Seed Production

There are two methods as below

a) **Seed-to Seed:** In this method, first season bulb crop is kept in the fields up to winter so as to produce seed in the next season. It is seed to bulb to seed in one go.

b) **Bulb-to–Seed method:** Bulbs produced in the previous season are selected, stored and replanted in next year for production of seed. It is most common method.

a) Seed-to Seed method

Climate: It is biennial crop and takes two full seasons for producing seeds. Bulbs are formed during first year. While flower and fruiting take place during second- year. It requires cool climate during early development of bulbs and also during early growth of the head stalk (Flowering). Blotting takes place between10 to 15 ^{0}C. During early stage, temperature should be cool with good moisture supply. For better bulb development high temperature with long photoperiod is essential.

Land requirement for onion seed crop: Land to be used for seed production of onion should be free from volunteer plants. Although onion can be grown nearly in all types of soil from sandy loam to heavy clay soil, but clays are not satisfactory unless well supplied with humus to lighten them. The soils pH should preferably be 6.0-6.8.

Isolation in onion seed crop: Onion seed field shall be isolated from contaminants *viz*; fields of other varieties and the fields of the same variety not confirming to varietal purity requirement for certification at least 5 m for foundation seed and certified seed during months bulb production and 1000 m and 500 m for foundation and certified seed production respectively during seed production.

However, the maximum permissible limit for bulb not confirming to the varietal characteristics is 0.10 per cent and 0.20 per cent (by numbers) for foundation and certified seed during mother bulb production. The maximum permissible limit of off- types is 0.1 per cent and 0.2per cent for FS and CS at and after flowering during seed production. Onion seed crop must also is isolated from any flowering multipliers types of onion and shallots.

Nutrition: The ratio of N: P: K applied during seedbed preparation should be 1:2:2 but the nitrogen ratio can be increased according to the status of the soil. Very limited work has been reported on the effects of nutrition in the first year on seed production in the second year. Ahmed (1982) [1] showed that application of N: P: K @ 150 kg ha^{-1} produced the largest bulbs and highest total bulb yield at the end of first year and that supplementary N application not exceeding 100 kg ha^{-1}in second year applied during anthesis enhanced seed quality. Higher levels of N increased the seed yield both at the expense of seed quality. The high K levels during bulb production were carried over to the second year and enhanced seed quality.

During, mother bulb production the deficiency of copper or manganese should not be allowed. The deficiency of copper is indicated by bulbs of poor colour with thin, fragile scales that come off in handling. Therefore, the application of 80-120 kg powdered copper sulphate control the deficiency.

Sowing: The seeds from approved source is produced and sown at the rate of 8 to 10 kg/ha in the nursery for raising seedlings. Sowing is done in the month of October or November. Seedlings of 8 to 10 weeks old are ready for transplanting. Such seedlings are transplanted in small beds 10-15 cms apart.

Harvesting: Well matured bulbs should be harvested when tops are druped and leaves are still green. After harvesting, bulbs should be thoroughly selected for curing. The time required for curing depends on weather condition *i.e.* 3 to 4 weeks.

Storage: Well matured, dried and cured bulbs are taken for storage. Such bulbs are stored in well ventilated storage. The shallow trays with performed bottoms are used. The temperature range should 0 to 5 0 C for 3 to 4 weeks prior to planting and may be increased upto 10 ^{0}C thereafter.

Disadvantages of seed-to-seed method:

1. Seed yield is very less-since bolting is not uniform and all the bulbs may not set
2. Quality of the seed is low

b) Seed Production (Bulb-to Seed): This method involves producing bulbs from seed in the first season and producing seed from graded bulbs from the previous season.

First season: Seed-to-bulb (Mother bulb production)

limate: Seed to bulb method can be taken in kharif season

where seeds are sown to get bulbs. For good vegetative growth need low temperature and short photoperiod. For better bulb development need high temperature and long photoperiod.

Soil: to produce good quality bulbs need sandy loam to silt loam to clayey soils. Soil pH should be between 5.8 to 6.5.

Sowing methods and seed rate: There are three methods for producing good bulbs.

Drill sowing: Recommended method for medium sized bulb production as it ensure thick sowing by restricting spacing. Seed rate required is 5.0 kg/ha.

Broad casting: Followed when there is late sowing. Seed will be sown by mixing with fertilizer or sand.

Transplanting: This method is improved one where nursery is raised and seedlings will be ready in 6-7 weeks. Transplanting is done on either flat beds or ridges and furrows**.**

Nutrition: The recommended dose of fertilizer is 125:62.5:62.5 NPK/ha along with minimum 25 t/ha of FYM. 50% of the N will be applied at field preparation and remaining at 35-40 days after sowing. Never apply fertilizer at bulb formation stage since bulbs may loose shelf life. Shelf life of onion bulbs is very important as these will be used to produce seed during rabi season.

Irrigation: Drip irrigation or sprinkler irrigation at eight days frequency with not less than 8-10 times required. Care must be taken to seed that no moisture or water stress at bulb development as it affect seed production in second season.

Weed management: Prone to weeds since thickly populated. Hand weeding is very expensive-hence weedicides are recommended. Weedicides like oxyflorofen @ 1ml/L as both pre and post emergent sprays.

Harvesting: Harvesting stage is very important due to stora ge of first season bulbs for seed production. The following points are considered for harvesting.

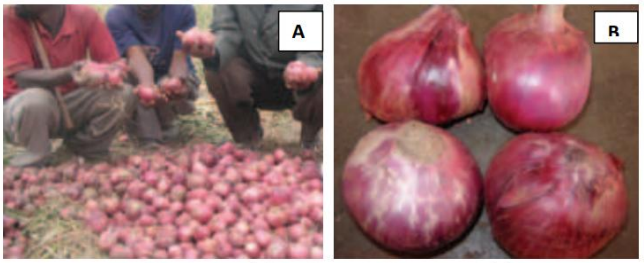
Maturity indices: 50% of neck fall with drying of leaves. At this stage neck thickness become thin and only closed bulbs at neck are to be harvested. Open necks may result in splitting of bulbs during storage.

Picking: Picking of bulbs individually and heaped in the field for 3-5 days for curing. After that foliage is cut and dried in the field under shade for 7 days.

Bulb yield from first season: 20-30 t/ha

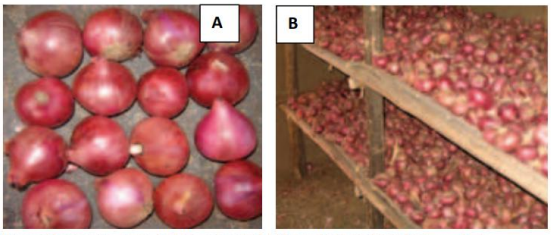
Second season-Bulb-to-seed (True seed production)
Climate: Bulb to seed method is taken during rabi season since for better and complete bolting required low temperature.

Selection of bulbs: Select medium sized bulbs roughly weighing about 30-50 g. Smaller and bigger bulbs are pooled and sold in the market (Fig.2) The bulb weight has markedly influenced the seed production in onion. The increases in bulb weight an increased the seed yield. Although an increase in wt. and size of bulb results in higher seed yield, but very large size bulbs (< 90 gm) if used will need a very high seed rate (60 q/ha). Large size bulbs (3-4 cm diameter) and weighing< 90 gm may seed yield 10.00 q ha^{-1} Choudhary (1967) [3].



Bulb selection (A) and large bulb rejected (B)

Bulbs rejected- split (A), and whitish (B) bulbs



Quality and true to type bulbs selected (A) and stored under good storage condition (B)

Problems in selection of bulbs: Smallest bulbs produce no bolting and also smaller umbels there by small less vigorous seed. Bigger bulbs produce longer flower stalk which may prone to wind damage.

Avoid- damaged, splits, sprouted and diseased bulbs.

Shape-Oval and round shaped bulbs are selected. Flat bulbs need to be discarded.
The bulb are lifted when the 75% plant show neck fall/top die down. The bulbs are dried/curing under naturally ventilated place then neck is trimmed leaving 2-3 cm attached with bulb. The bulbs are roughed at this stage based upon the colour, shape and size. The damaged, twin bulbs and long necked bulbs if any are discarded. The medium size bulbs weighing (50-80 g) bulbs are selected and stored. The bulbs are and examined again before replanting in the following season.
One hectare of bulbs from the first year will plant3-5 ha for the seed production, the bulbs selected for seed production and usually referred to as mother bulbs. However, the area coverage is greatly affected by storage method and losses occur during storage. The storage temperature also influences seed yield. The temperature ranging from 4.5 to 14^0C with an optimum of about 12^0C is the best for the storage of mother bulbs that are to be planted for seed production. The plants from such bulbs produce early and heavy yield than those grown from bulbs that have been stored at higher or lower temperature. The roots of the bulbs should be left intact after harvest.

The 1\3 parts of the bulb are cut before planting to examine the number of glumes, which is related to the compactness, and shape of the bulbs. More the number of glumes flatten the shape and poor the storability. To avoid rotting due to fungal infection of the bulb in field, Bavistin @ 10 gm in 10 lit of water is used for dipping the bulbs before planting. This should be practice in NS/BS seed production

Time of planting in onion crop: The time of planting has great impact over the seed yield and incidence of the disease. Whenever the seed crop is planted in first fortnight of October is subjected to the heavy incidence of diseases and resulting poor seed yield. Tomar and Negi (2002) [10] has recorded the highest seed yield of 576.80 kg/ha with low incidence of diseases and better seed quality in cv. Pusa Madhavi in 15th November planting during rabi 1999. However, the higher seed yield (1251.66 kg/ha) with complete escape from the incidence of disease in cv. Pusa Red was recorded during rabi 2000. Planting of bulbs in ridges and furrows with narrow spacing 20-25 X 15 cm. But the preferred method is to plant on flat beds of 5 X 3.5 m size with 1m space in between. A drip line for every three lines can be laid.

Irrigation in onion seed crop: Hawthorn (1951) [5] found that high soil moisture in the seedling year performed high seed yields. Borgo *et al.* (1993) [2] reported that water stress during bulb sprouting and beginnings of the anthesis reduce the number of umbels and flowers/plant. However, in practice, the soil surface should not be continuously wet because it will predispose the crop to infection to root rot/damping off.
The methods of irrigation also greatly influence the seed yield and seed quality of onion. Tomar *et al*. (2004) [9] observed that drip method of irrigation gave higher seed yield (894.94 q/ha) than the surface irrigation (648.94 q/ha) in onion Cv. Pusa Madhvi. The seed vigour index is also higher in drip (876.49) than surface (663.71) irrigation in onion Cv. Pusa Madhvi.

Roguing: Off types plants having different foliage colour, late maturing bulbs etc are removed during first year and at the time of harvest also, bulbs having different colour, neck thickness and doubleness are rejected. During second year, the plants differing and not conforming to varietal characters are removed.

Harvesting: The harvesting of seed can start at 110-120 DAS. All the umbels will not come for harvesting at once. Usually 4-5 harvestings are possible. Harvesting can be done when 8-10 black seeds appear in umbels. Delay may result in heavy shattering. Seeds are cleaned by dipping in water for 5 to 10 minutes followed by sun drying.

Yield: The average yield of 850 to 1000 kg/ha is obtained from good crop.

Insect pests of Onion and their management: Onion is a most important culinary commodity grown in India. Full yield potential of the crop is not realized due to number of constraints. Among them pest and diseases are the major constraints in onion production. Pest and disease management is crucial for obtaining good quality marketable bulb. Major insect pests and diseases of onion with their symptoms and management practices are given below:

Sl. No.	Description	Symptoms	Comments	Cause	Management
Diseases					
1.	Black Mold (*Aspergillus niger*)	Post-harvest black discoloration at neck, lesions on outer scale	Wash hands after coming into contact with fungus	Fungus	Seeds to be treated with appropriate fungicide to reduce rot in mature bulbs, storing at temperature below 15 degree Celsius reduces mold from spreading, avoid bruising bulbs
2.	Botrytis leaf blight (*Botrytis Squamosa*)	Small white lesions with light green halos which may slightly expand as they age	Disease emergence favours high humidity and warm temperatures, older leaves are susceptible to blighting than younger leaves	Fungus	Allow at least 30 cm spacing between plants to promote good air circulation and quick drying of foliage after rain, appropriate fungicide sprays also required
3.	Downey mildew (*Peronospora destructor*)	Pale and elongates patches on leaves, leaves turning pale then yellow	Disease emergence favoured by cool temperature and leave wetness	Fungus	Plant in well-draining areas and don't over crowd plants, avoid infected plant sets, apply appropriate fungicide and destroy infected crops
4.	Fusarium basal plate rot (*Fusarium Oxysporum*)	Necrosis begins at leaf tips and move downwards, Wilting plants, infected bulbs may be brown and watery with rot spreading from stem plate to basal leaves	Disease emergence favours moderate to high temperatures	Fungus	Rotate with non-susceptible crops for at least 4 years, plant resistant onion varieties
5.	Pink Root (*Phoma terrestris*)	Pink roots which darken and turn purple, roots become transparent and water soaked	Fungus colonizes through root tips, fungus can survive in soil down to a depth of 17.7 inches	Fungus	A rotation of 3 to 6 years is preferred, plant more resistant varieties, fumigation can help reduce the pathogen in the soil
6.	Purple Blotch (*Alternaria porri*)	Severely infected foliage may die, large lesions may coalesce and girdle leaf, killing any tissues between the lesions and leaf tip	Disease emergence favoured by wet foliage, with sporulation occurring in night period on high humidity	Fungus	Fungicides are effective at controlling the diseases but should be rotated for optimal control, Cultural controls includes long rotation and the reduction of leaf wetness by planting in well – drained soil and timing irrigation
7.	Pythium seed	Seeds water soaked and	Disease emergence favours	Fungus	Can be controlled by minimizing

	rot (*Pythium irregular*)	decomposing, seedlings that have already emerged prior to infection collapse and die	high soilmoisture and cool temperatures		moisture, treat seeds with appropriate fungicides prior to planting
8.	Fusarium damping-off (*Fusarium oxysporum*)	Rotting seeds, discoloured root tips which may be pink, tan, yellow, red or black	Fungus survives in soil and emergence is favoured by moist to wet soil	Fungus	Plant only disease free seed, treat seed with fungicide, rotate crops to reduce the levels of pathogen in soil
9.	White rot (*Sclerotium cepivorum*)	Older leaves yellowing, stunned growth, fluffy white growth on base of bulb which spreads up bulb to storage leaves	Fungus can survive in soil for 20 years and is one of the most damaging diseases of Allium crops worldwide	Fungus	Fungicides along with cultural methods recommended, treat seeds with hot water prior to planting, use long term rotation with non-allium crops
10.	Smut (*Urocystis colchici*)	Dark, thickened areas on cotyledons which may become large and causes leaves to bend downwards, lesion mature and become covered in black powdery fungal masses, plant growth stunted	Smut can persist in soil for many years and is mainly introduced through infected seeds and transplants	Fungus	No resistance to disease known in onion, plant only healthy seeds and transplants – if smut is present in the soil they will not become infected
11.	Leaf streak and bulb rot (*Pseudomonas viridiflava*)	Dark green oval lesions or streaks on leaves, reddish brown discoloration of inner scales, rot developing in ring like pattern	Greatest damage occurs during winter, rapid spread of disease on infected plants is promoted by rainfall	Bacterium	Avoid fertilizing during winter, apply appropriate bactericidal sprays
12.	Onion yellow dwarf Onion yellow dwarf virus (OYDV)	Yellow streaks on bases of first leaves, leaves may be flattened or crinkled, flower stalks yellow and twisted	Transmitted by several aphids, including peach aphid, virus is not spread via seed or pollen	Virus	Plant more tolerant varieties, remove infected plants, to certain extent insecticides can be used to control aphids, planting sets or transplants which were produced in area free of virus
Insect Pests					
1.	Thrips (*Thrips tabaci Frankliniella occidentalis*)	Distorted tissues, scarring of leaves, infected plants may have a slivery appearance	Most damaging at the initial stage of bulb development	Insect	Predatory mite, pirate bugs and lacewings are natural enemies, avoid planting onion in close proximity, apply appropriate insecticides, overhead irrigation can helps to reduce thrips
2.	Rust (*Puccinia Porri*)	Small white flecks on leaves and stems which develop into circular or elongated orange pustules, severe infestations can cause leaves to yellow and die	Favours high humidity and low rainfall	Fungus	No resistance, apply appropriate protective fungicide
3.	Leafminers (*Lyriomyza spp.)*	White and winding trails on leaves, early infestation can cause yield to be reduced	Mature larvae drop from leaves into soil to pupate, entire lifecycle can take less than 2 weeks in warm weather, insect may go through 7 to 10 generations per year	Insects	Check for leafminers before planting, remove plants from the soil after harvest, use appropriate insecticide whenever required.
4.	Onion Maggot (*Delia antiqua*)	If infestation occurs during bulbing, bulbs will be deformed and susceptible to storage rots after harvest, stunted or wilting seedlings, adult insect lay eggs around the base of plant and the larvae that emerge are tiny and bore into onion plant	Females can lay hundreds of eggs during their 2 to 4 week life span	Insect	Can be managed by good sanitation and appropriate insecticide.
5.	Bulb Mites (*Rhizoglyphus spp. Tyrophagus spp.)*	Stunted plant growth, bulbs rotting, pest is a cream – white, bulbous mite which resemble pearl with legs	Damage by bulb mites allow secondary invasion by other pathogens and causes bulb rots	Arachnid	Don't plant successive crops of onion or garlic in same location, allow fields to fallow to ensure that any residual organic matter decomposes completely because crop residues harbor mite population
6.	Pythium seed rot (*Pythium irregular*)	Seeds water soaked and decomposing, seedlings that have already emerged prior to infection collapse and die	Disease emergence favours high soilmoisture and cool temperatures	Fungus	Can be controlled by minimizing moisture, treat seeds with appropriate fungicides prior to planting

Raichur district farmers involved in onion seed production

1. **Shantagouda:** Nagaral, Tq: Lingsugur, Dist: Raichur, M. No.: 9902553839

a. Seed to Bulb:
Variety: Local variety

Nursery: 21m X 1.5 m, manuring is done with FYM and Cow Urine, 500 m^2nurseryis sufficient for ½ acre, 2 hand weeding

Sowing: Last week of April, Broadcasting

Transplanting: 45-50 days after sowing old seedlings are transplanted to main field

Main field: Ridges and furrows with two sides

Spacing: 15 X 10 cm^2

Irrigation: once in six days for sandy soil and once in 10-12 days for clayey soil

Weeding: 3 hand weedings

Harvest: 100-110 days after transplanting

Bulb yield: 10-15 q/ ½ acre

b. Bulb to seed
Planting: November, ¼ portion of the bulbs are removed and used for planting

Spacing: 50 X 25 cm^2, Ridges and furrows with onside planting

Bulb selection: Medium sized bulbs are selected with multiple sprouts

Manures: FYM and Cow Urine

Harvest: 15-20% of the crop should be dried, 120-130 days after transplanting. Harvesting of umbels should be done three times how the flowers attain maturity. Harvested umbels are sun dried for one day and shade dried for two days. Umbels are threshed by stick beating.

Seed yield: 120-150 kg/ ½ acre.

2. **Ranganna:** Kottadoddi, Tq: Deodurga, Dist: Raichur, M. No.: 9900965693

a. Seed to bulb
Direct sowing: Seeds are directly sown by broadcasting in main field with the bed size 1 X 15 m^2during May month,here duration for getting bulbs is reduced compared to transplanting methodand labour cost is also reduced so that less cost of cultivation and yield is also high in case of direct sowing.

Variety: Rajolli local

Manures: DAP is mixed with seeds and used for sowing and again DAP is applied to the soil at the time of bulb initiation.

Weeding: Weedicide Pendamethalin @ 4 ml /l of water spray as a pre-emergent, oxy-chloropyrophos @ 2ml/l of water as post-emergent and 2-3 hand weedings.

Harvesting: Maturity index is part of the crop should be lodged, 100-110 days after sowing

Bulb yield: 45-50 q/ acre

b. Bulb to seed
Planting: Medium sized bubs are selected and bulbs are planted in the month of November

Spacing: 30 X 30 cm^2

Manures: 2 bagsDAP and 1 bag of MOP / acreat the time of planting

Irrigation: Once in 5-6 days

Harvesting: March, 120 Days after bulbplanting

Seed yield: 250- 300 kg/acre

3. **Bhaskarareddy –** Ele Bichal, Tq: Dist: Raichur, M. No.: 8762093022

a. Seed to Bulb
Sowing: May first week

Nursery: 7 X 1 m^2 bed is prepared, 2 hand weedings

Transplanting: 30-40 days after sowing old seedlings are transplanted to main field.

Main field: 2 X 2 m^2 plots with ridges and furrows, seedlings are transplanted on the both the sides of the ridge.

Spacing: 10 X 10 cm^2

Manures: 2 bags urea and 1 bag DAP/ acre

Weeding: 3 hand weedings and one post-emergent spray with Oxy-gold

Irrigation: once in every 3 days

Harvest: The crop is lodged 15-20 % and leaves will dry are the maturity indices for harvesting

Bulb yield: 60-70 q/ acre

b. Bulb to seed
Planting: Last week of Nov and first week of Dec, medium sized bulbs are selected for seed production which gives higher yields

Spacing: 30 X 30 cm^2

Irrigation: Once in every 4- 5 days
Manures: FYM, Urea 2 bags, DAP 1 bag and MOP 1 bag

Weeding: 2 hand weedings up to flowering

Harvest: The umbels are harvested when they are turned to black and dried

Seed yield: 300 kg/ acre

4. Badesab- B. Hanamapur, Tq:Dist: Raichur
a. Seed to bulb
Sowing: April last week and First week of May

Nursery: First raise the nursery 1.5 X 10 $m^2$and transplanted to main field 30 days old seedlings

Main field: 3 X 2 m^2 plots with flatbed

Spacing: 15 X 10 cm^2

Manures 3: tonns/acre FYM, 1 bag urea, 1 bag DAP and 1 bag MOP

Irrigation: 6-7 days interval

Weeding: Pre-emergent as Penamethalin @ 3 ml/l and post-emergent as Oxy-gold @ 10 ml/l and 2-3 hand weedings

Harvest: 120-130 days, lodging and drying of the foliage

Bulb yield: 30-45 q/acre

Bulb to seed
Planting: Medium sized bulbs are selectedand planted during October last week and first week of November

Spacing: 50 X 30 cm^2

Irrigation: 4-5 days interval

Weeding: 2 hand weedings

Harvest: 125-130 days after transplanting, the crop is started to lodge and harvested bulbs are threshed manually by beating with stick after thorough drying in sun

Seed yield: 200-250 kg/acre

5. Veeranagouda- Katakanur, Tq: Dist: Raichur

a. Seed to bulb

Sowing: Last week of May- first week of June, Seedlings are raised in nursery and transplanted to main field

Main field: 5 X 1 m^2, seedlings are transplanted to the main field after 45 days of sowing

Manures: FYM @ 2-3 tonns/acre and Urea 2 bags, DAP 1 bag and 1 bag MOP

Weeding: Post-emergent spray with the oxy-gold and 2-3 handweedings

Irrigation: 4-5 days interval

Harvest: When the part of crop is lodged, 110 days after transplanting

Bulb yield: 30 q/acre

Bulb to seed

Planting: In the month of November, Medium to large sized bulbs are selected. Onion seed production is done with the ground nut crop intercropping

Spacing: No specific spacing is maintained

Manures: Urea and DAP each 1 bag/acre

Weeding: 2-3 hand weedings

Irrigation: 7-8 days interval

Harvest: when the crop will start lodging

Seed yield: 70-100 kg/acre

Conclusion

In our country more than 20% of onion seeds are used from their own farm saved seeds for sowing. Since, from last 20 years the Raichur district farmers are continuously involved in the onion seed production. Farmers are producing seeds in lesser quantities for sowing of their own field in next season. They are supplying the seeds to neighbor farmers and for their own farm.

References

1. Ahmed AA. The influence of mineral nutrition on seed yield and quality of onion (*Allium cepa* L.). Ph.D Thesis, University of Bath, 1982.
2. Borgo R, Stahlsehmidt DM, Tizio RM. Preliminary study on water requirements of onion cv. Valcatarce in relation to seed production. *Agri. Scientia.* 1993; 10: 3-9.
3. Choudhary. Vegetables. National Book Trust, India. New Delhi. 1967, 96.
4. Currah L, Proctor FJ. Onions in Tropical Regions. Natural Resources Institute Bulletin, 1990, 35.
5. Hawthorn LR. Studies of soil moisture and spacing for seed crops of carrots and onions. U. S. Dept. Agric. Cir. 1951, 892.
6. Jones HA. Vegetable breeding at the university of California. Proc. Am. Soc. Hortic. Sci. 1933; 29:572-581.
7. Srinivas PS, Singh RP, Lawande KE. Integrated Pest and Disease Management in Onion and Garlic. Technical Bulletin No.17.ICAR-Directorate of Onion and Garlic Researxch, Pune, Maharashtra, 2007, 34.
8. Sankar V, Thangasamy A, Jai Gopal. Improved cultivation practices for onion. Tehnical Bulletin No. 21. ICAR-Directorate of Onion and Garlic Researxch, Pune, Maharashtra. 2014, 23.
9. Tomar BS, Singh B, Hassan M. Effect of irrigation methods on seed yield and seed quality in onion cv. Pusa Madhavi. *Seed Res.* 2004; 32:72-81.
10. Tomar BS, Negi HCS. Effect of planting time on seed yield, quality characters and disease incidence in onion (*Allium cepa* L.). In; Proceedings of XI National Seed Seminar on Quality Enhance Agricultural Profitability held at UAS Dharwad, 2002, 18-20.