

# ONION SEED PRODUCTION IN SRI LANKA

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## ABSTRACT

In order to produce onion seed in Sri Lanka, two trials were conducted by using cv. 'Poona Red'. In the first trial, the temperature required for flower bud differentiation and the duration of the period of low temperature treatment were determined. In the second trial, the actual seed production of onion based on the first trial was analysed. Exposure of mother bulbs to the highland conditions for one month (temperature min. : 12.5°C, max. : 18.8°C) was effective for flower bud differentiation. The use of a house with a plastic film roof was also effective in protecting the plants from diseases and the flowers from rain though devernalization was observed to some extent.

## Introduction

There are two types of onions in Sri Lanka : one called Red Onion (*Allium ascalonium*) and the other called Bombay Onion (*Allium cepa*) (Handbook for the Ceylon farmers). The former is propagated by bulbs and the domestic production amounts to 20,000 tons against a demand of 30,000 tons. The domestic production of the latter is 5,000 tons against a demand of 60,000 tons, and 50,000 tons of onion is imported (CWE statistics 1986).

As the so-called Bombay onion has a good marketability and storage ability in Sri Lanka, the planted acreage of onion has increased remarkably in the dry zone area. At present, all the seeds have been imported, the major variety being Poona Red. In 1985 3,500 kg of seeds were imported and it is estimated that 6,000 kg will be imported in 1988.

However, the following problems have occurred recently under the present seed quality and seed supplying systems.

- 1) It is difficult to obtain onion seeds before the middle of April which is the optimum sowing time of the seeds. If sowing is delayed, the first rains will come to the field at harvesting time resulting in rotting and deterioration of the products.
- 2) Poona Red which is available in the market lacks uniformity. Especially a certain degree of segregation is observed in the skin color and initiation of bulbing. The red skin is the most preferred characteristic of the onion for the people of the island.
- 3) It is difficult to change the presently imported variety as quality seeds from overseas are more expensive than the present ones. The price of Poona Red is Rs300/kg while Red Creole which is imported from Europe fetches Rs1,350/kg (1 rupee=5 yen).
- 4) It is difficult to store remaining seeds to the next year. Due to inadequate storage facilities, cultivation can often result in some seeds showing poor germination in farmers' fields.

Therefore production of onion seeds in the island has become a priority. The technical cooperation project started in February 1985 (The Integrated Agricultural Development Project in the Mahaweli Area) is being implemented by JICA. The onion seed production program has been incorporated into the Project, and the work was initiated in August 1985.

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## Materials and targets of selection

The required characteristics of onion in Sri Lanka are red skin, strong pungency and non-disintegrating flesh for boiling. Though the present Poona Red variety lacks uniformity, it has many excellent characteristics which are adapted to the area. Therefore the mother bulbs are selected from Poona Red based on the following conditions.

- 1) Red skin and weight of 50-100 g.
- 2) Bulbs which can be harvested with the tops falling within 3 and half months after transplanting of seedlings in the middle of May (sowing in the middle of April).

## Preliminary trial on required low temperature and duration of period for flower bud differentiation

### 1 Materials and methods

The mother bulbs of cv. 'Poona Red' which have a red skin and weigh 50-100 g were selected at farmers' fields in Dambulla, September 1985. Each treatment involved 108 bulbs and the bulbs were kept at the Potato Farm in Nuwara Eliya (2400 m above sea level) and the Dem/Exp Farm in the lowlands (80 m) on November 21, 1985, respectively. One, two and three months after the treatment, the onion bulbs were planted in the Dem/Exp Farm on December 20, 1985, January 20, 1986, and February 20, 1986, respectively.

### 2 Results

- 1) After one month's treatment at Nuwara Eliya where the minimum average temperature was 12.5°C and the maximum average temperature 18.8°C, bolting was observed 30 days after planting (January 20), flowering at 50 days (February 20) and seed heads were harvested 100 days after planting.
- 2) However, the onion bulbs which were treated at the Dem/Exp Farm (control) also showed signs of bolting on February 18 and flowered on March 10.
- 3) In the case of 2-month and 3-month's treatment, the sprouting mother bulbs which were too elongated during the treatment showed poor growth after planting and finally died.
- 4) In February heavy rains came resulting in low seed setting.

**Table 1** Temperature at the Dem/Exp Farm and Nuwara Eliya (1985-86)

		November	December	January	February
The Dem/Exp Farm (Lowlands)	Max	31.3	29.4	29.8	32.1°C
	Min	22.3	20.8	21.1	20.7
Potato Farm (Nuwara Eliya)	Max	19.3	18.8	18.3	19.4
	Max	12.3	12.5	11.2	11.1

### 3 Discussion

- 1) Bolting and flowering of Poona Red were induced in the lowlands where the minimum temperature is 20-21°C and maximum temperature is 30-32°C though bolting was late and flower heads were small. It thus appears that the low temperature required for flower bud differentiation in Poona Red was considerably high.
- 2) However, it is considered that bolting and flowering were induced by very critical temperature conditions. If seed production is repeated under these conditions, the seeds could be collected from plants in which bolting was readily obtained. Subsequently unexpected flower bud differentiation and bolting may be induced in actual fields for onion cultivation resulting in low yield and low quality bulbs. Therefore flower bud differentiation in the highlands which provides sufficiently low temperatures was em-

ployed in the next trial. Exposure to low temperature for one month was not only effective for flowering but also good for uniform sprouting from the dormant bulbs.

3) The temperature was lower from December to February together with the appearance of rain showers. If rain had persisted during the flowering time as in this trial, efforts during the trial would have been wasted. Changes in the time of planting of the mother bulbs or the construction of the house with a plastic film roof is required so as to protect flowers from the rain.

4) The following cropping pattern which involves a combination of table-onion cultivation and seed production is suitable if the seeds are produced before the sowing time of onion.

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Table-onion											
Cultivation											
F		H		S		P		H		Seed Production	
										T	
										P	

S : Sow, P : Plant

H : Harvest

T : Treatment of bulb

F : Flowering

## Onion seed cultivation under house with a plastic film roof

### 1 Materials and methods

Mother bulbs with red skin, slender neck and weighing 50-100 g were selected from bulbs which were harvested at the Dem/Exp Farm in September 1986. The mother bulbs were brought to the highlands in Nuwara Eliya to be exposed to natural low temperature from December 7 to January 6, 1987. On January 7, the mother bulbs were brought down to the Dem/Exp Farm and the bulbs were soaked in a solution of Benlate (1,000 x) for 20 minutes. NPK was applied at the rate of 10 kg, 20kg, 10kg/10 a prior to the planting. Then the bulbs were transplanted to the beds 1 m wide with 3-row planting. Plants were 30 cm apart. Captan, Dithane and Benlate were sprayed at 10 day intervals, respectively.

As the flowers of onion bloomed on March 5, they were pollinated with a down brush. By the time when black seeds were exposed on April 20, the seed heads were harvested.

### 2 Results

1) Plants did not show Purple blotch (*Alternaria porri*), which had damaged plants seriously in the previous year, due to the cultivation under the house with a plastic film roof and the periodical sprays of pesticides.

2) The bolting ratio of the mother bulbs was 75% and the number of seed heads per plant was 2.4. Some of the plants showed vegetative growth at the top of the flower bud as a pencil cap resulting in poor flowering.

3) Number of flowers per seed head was 302, number of fertilized flowers per seed head was 100, fertilization percent was 33% and number of seeds per seed head was 316. In some of the flowers the length of the filament varied resulting in random blooming of flowers.

4) Seed yield of 2 sets cultivated in houses with a plastic film roof (205 m<sup>2</sup>) was 3.8 kg (9.2 kg/10 a).

Table 2 Observation of flowers

Item	
Rate of bolting	75%
Number of seed heads per plant	2.4 seed heads
Number of flowers per seed head	302 flowers
No. of fertilized flowers per seed head	100 flowers
Fertilization ratio	33%
Number of seeds per seed head	316 seeds

20 plants were counted



Flowering time of onion in house with a plastic film roof

### 3 Discussion

1) The seed yield of 9.2 kg is extremely low. As the size of the plant is small, if the plant spacing were to be reduced from 30 cm to 15 cm, it might be possible to increase the yield by increasing the plant population.

2) The bolting ratio is too low. It is considered that the effect of the vernalization treatment may be eliminated by the high temperature which is not conducive to bolting under the house with a plastic film roof (devernalization). The use of the cover with a plastic film is necessary to protect flowers from rain but continuous and extremely high temperature (45°C) must be avoided. Painting the roof in white or shading the roof is required to prevent the increase of plant temperature.

3) The onion bulbs were placed in a wooden flat and piled in 5 stories for a month in the highlands. As a result, the onion bulbs which were kept in the lower flat exhibited yellowish elongated sprouts (10-15 cm) due to the absence of light. It was observed that plants with a low bolting rate originated from the bulbs which had yellow sprouts. Exposure to sunlight may be related to flower bud differentiation in onion. Therefore piling of onions in the flat should be avoided.

4) Flowers were pollinated with a down brush in order to increase the seed setting ratio. However, it was observed that the stigma was injured by the brush. Also while the

flowers were blooming, some jungle big bees visited the flowers. It may be desirable that the jungle bees are fully utilized as pollinators.

5) During the treatment in the highlands, some bulbs became soft and light after sprouting and root development was very poor after planting. It is important to select fully mature bulbs as mother bulbs.

If the recommendations outlined above are followed, onion seeds could be produced in the island even though Sri Lanka is located in the low latitude tropics. Furthermore, if a dry area where rainfall is low in January to March could be identified, the use of a house with a plastic film roof may not be necessary, resulting in more effective seed production.

## References

- 1) Agricola (1978) : Handbook for the Ceylon Farmer.
- 2) Luxman Peris, A. J. (1987) : Effectiveness of Marketing Boards in Achieving Specific Marketing Goal with Special Reference to Cooperative Wholesale Establishment in Sri Lanka.

## Discussion

**Thongjiem, M.** (Thailand) : Did you evaluate in the field segregation and quality of the seeds produced in Sri Lanka compared with imported seeds ?

**Answer :** The incidence of white skin bulbs which is an unfavorable characteristic was reduced in the farm seeds compared with the commercial ones. No other differences were observed so far.

**Saharan, H. A.** (Malaysia) : Could you clarify what stage of maturity you are referring to when stating that the mother plant or bulb selected must be fully mature.

**Answer :** Onion bulb was considered to be fully mature when the top (foliage) fell and became yellow and when the neck was slender (empty neck portion). Mature bulb showed a good storage ability, lower loss of weight during low temperature treatment and good rooting ability after planting.

**Saxena, M. C.** (ICARDA) : Did you determine the temperature and minimum duration of exposure to this temperature required to devernalize the mother bulbs of the vernalized plants of onion ?

**Answer :** I did not measure the precise duration for devernalization of onion. However when plastic films were used as cover for rain protection the number of devernalized plants increased markedly due to the increase of the temperature. The plastic film which was employed from planting to seed maturity was necessary to prevent insect attacks.