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ONION PRODUCTION AND MANAGEMENT UNDER IRRIGATION



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**ONION PRODUCTION AND MANAGEMENT
UNDER IRRIGATION**

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1. **Introduction**

Onion (*Allium cepa*) is a vegetable crop grown almost all over the world. It is grown mainly for its bulb, which is used in every home, almost daily. It is rarely used as a sole dish or in large quantities. Its main use lies in flavouring and seasoning of a wide variety of dishes. Its popularity is due to its aromatic, volatile oil, the allyl-propyl sulphide which imparts a cherished flavour to food. As a constituent of a meal, both the green leaves and bulbs can be eaten raw, cooked or fried, or in soups and salads. Onion also has an important role as a medicinal herb in many communities, and is claimed to minimize high blood pressure and other heart diseases due to its favourable action on the elasticity of blood vessels. As an item of world trade, onion ranks second in importance after tomatoes among the vegetables. In 1987, the total world export production amounted to over 2.0 million metric tones and worth over 299 million US dollars. World production of onion has increased steadily from about 11 million metric tones produced on an area of nearly 0.9 million hectare in 1969 to over 25 million metric tones produced on an area of above 1.7 million hectares in 1987. These figures represent and percent increases in total production and at as respectively.

Onion is grown widely during the wet and dry seasons. However yields are much higher during the dry season because of fewer incidences of pests and diseases. Prices of onion tend to increase during the dry season before harvest begins, due largely to the inability of the farmers to store the highly perishable crop. Dry season production of onion is on the increase due to the provision of more irrigation facilities

All over the country. Although onion has been grown in Nigeria for a long time, the yield is still low compared to other regions of the world. The reason for this is because improved production practices based on research findings have not been made available to the generality of farmers. This bulletin aims therefore to present the research recommendations to enable the attainment of improved yields.

2. **The Crop**

Onion (*Allium cepa*) belongs to the family Alliaceous. Onions are naturally packed vegetables consisting of fleshy connective scales, which are enclosed, in paper like wrapping leaves. The stem from which the roots arise is very short. Leaves are produced from the apical meristem. The bulb, for which the crop is grown, is formed differently and specifically. They are still physiologically long day plants but ones, which respond to days, which are short. Short day cultivars can initiate and form bulbs under photoperiods of thirteen hours or less. Onions therefore could be classified as short day or day neutral.

Soil type

Onion can grow on most soil types. However, well-drained medium textured soils with PH 6-7 are particularly good for the crop. Flat land enhances good yield.

Cultural Practices for Onion Production Land Preparation

This depends on the particular area where onion is grown. For general purposes however, ploughing and harrowing the land to prepare a good and flat seedbed is necessary. The dry season onion is normally grown in basins under favourable conditions of day length and temperature when the plant has reached a certain stage of growth. Pollination is usually by insects.

Climatic Requirements (Temperature requirements)

The temperature requirement for the crop is between 15oC–25oC. Trials have shown that growing onion in warmer weather leads to bulb retardation. Low atmospheric humidity, and clear bright days are also necessary to ensure insect activity for pollination. Vitalization (initiation of flowering due to extended exposure to low temperature) is required for flowering in onions. The lower the temperature, the shorter the vitalizations temperature is necessary.

Day length Requirement

The onions grown in tropical regions are often referred to as short day cultivars. This does not mean that these onions are physiologically short day plants, a term which has a diluted in a seedbed where irrigation is available. Water at this stage should be applied every two days until the bulbils appear. Mature bulbils called setts are separated and planted in the field during the dry season. The number of setts produced depends on the variety and size of the bulb. A good size bulb of the variety Wuyan Bijini will give 15-20 setts.

b) The direct seedling method

This method of planting is the lowest popular employed by farmers. The onion seeds are not planted straight into the field. The seeds are first grown in the nursery and the seedlings later transplanted into the field.

Preparation of Nursery Beds

For good germination in the nursery, a well-tilled seedbed with a fine loose surface is necessary. The seedbed should be moist fowl dropping and compost are worked into the seedbed before sowing.

After preparing the seedbed, mark it out in rows, which should be about 10-15cm apart in a 120 cm wide seedbed. Then a groove of about 12mm depth is made along each row. The seeds can now be sown in either of two ways. The first method is to mix the seeds with an equal amount of fine sand. The mixture of sand and seed is then evenly spread in the groove. The second method is to first spread the sand into the groove. The seeds are then spread evenly over the sand in the groove.

After sowing the seed, the groove is lightly covered with soil. The seedbed should be cover with light mulch and watered once or twice a week. After germination, the mulch is removed. Hand weeding and watering should continue until the seedlings are 6-8 weeks old when they should be ready for transplanting.

Field Planting

The land for transplanting should be well prepared and leveled.

Transplanting

Seedlings should be transplanted to the field six-eight weeks after sowing in the nursery. When transplanting, spread the roots carefully in the natural position before pressing the soil around the plant.

Planting Dates

The planting dates for the dry season crop is between October – January. The seeds are sown in seedbeds in October to January.

Fertilizer Recommendation

Onion requires good fertilizer application. Generally, any fertilizer application should be based on soil test. The amount of nutrients required to onion production varies from location to location depending on the inherent soil fertility. For general purposes however, a fertilizer rate of 65 kg N/ha – 40kg p/ha and 45kg k/ha TS recommended.

Fertilizer Application

Fertilizers can be applied four weeks after transplanting, apply the recommended close.

Weed Control

The first step to effective weed control is good land preparation. Onion is sensitive to weed competition during the early growth stage of the crop. Care should be taken during the weeding both in the nursery and field to avoid destroying the seedlings. The common and preferred method is hand weeding. The use of herbicides is not very widespread.

As most of onion production is carried out during the dry season, the water management of the crop is therefore very important. Onion is comparatively sensitive to water stress, and its growth can be inhibited well before the leaves wilt visibly from high temperature or drying weeds. For irrigation purposes, the amount of moisture needed by the plant is about 350-550mm. The irrigation frequency is between 5-7 days and the number of irrigation per growing season is about 15-20 times.

In addition, good drainage is also very important as onions are badly affected by water-logged conditions.

Pests and Diseases and their Control

a) Insect Pests

The common insect pests that affect onions are thrips (*Thrips tabaci* Lind), onion maggot (*Hylemya antiqua* Meig), and sea corn maggot (*Hylemya cilicrura* (Rondani) salt marsh caterpillar (*Estigmene acrea* Drurn), wireworms of the genus *limonius*, cutworms of the family *Noctuidapea* leaf miner (*Liriomiza langei* Frick) and several species of mites.

i) Crickets

These are pests of onion that causes serious damage to an onion crop, particularly at the beginning of the season, both in the nursery beds and after transplanting in the field.

ii) Moth (*Prodenia litura*)

The larvae of the moth eat the leaves of onion and can sometimes be serious.

iii) Thrips (*Thrips tabaci* Lind)

Both the larvae and adult thrips cause damage. They feed on the contents of leaf epidermal cell, which then become air filled to give a silvery appearance. Infested leaves of older plants may become distorted while younger onion plants may be killed.

Iv) Onion Maggot (*Hylemya antiqua* Meig)

This is a light greenish-gray fly. It feeds upon onion plants of all ages, from young seedlings to mature bulbs.

v) Seed-corn Maggot (*Hylemya Cilicrura* Ronae).

This attacks the onion plant at the germinating seed stage and the very young seed. It can be classified as a nurse pest.

vi) Wireworms (*Alimonies* spp)

These are the larval stage of the click beetle, it is hard shelled, yellow or brown in colour. Attacks by wireworms are often very serious especially if onions are sown on virgin soil.

vii) Spider Mites

These mites (*Tetranychus* spp) feed on onion bulbs. On the bulbs red spiders are found mostly on the under surfaces of the leaves. They suck juice from the epidermal cells, giving the leaves a bleached appearance. If they are not checked, a delicate web may be spun over most of the plant, and if they are not controlled in the field, the spiders spin a fine web over the inflorescence, which prevents visitation by pollinating insects.*****

Control

For effective control of these insect pests, an integrated approach must be adopted. At times climatic conditions may help, as for instance cold temperatures slow down the activities of thrips. Chemical control remains the most effective way to control these insect pests. Recommended chemicals include Toxiphan, Malathion, Heptachlor, Dieldrin or Parathion. Furthermore, sanitation also helps to reduce the incidence of pests.

b) Nematodes

The onion strains of the stem and bulb nematode (*Ditylenchus dipsaci*) are a tiny, worm-like organism that is barely visible to the naked eye. When onions are grown on infested soil, emergence of the seedlings is somewhat retarded. During storage, activity of the nematodes continues, and bulbs become lighter in weight and somehow puffy. When plants die, the nematodes remain in the dead tissue or enter the soil and attack a new host. They can remain in a dormant condition for long periods.

Stubby root nematodes (*Trichinosis Christies Allen*) are nematodes that attack onion roots resulting in stunted onions, which occur in patches. The stunting is most evident early in the season and becomes less apparent late in the summer. Affected onions have only a few short roots, which are yellowish in colour and have dark brown tips and numerous localized lesions.

Control

Nematodes are best controlled using chemicals like telone.

Diseases

Onion twister (*Colomeralla singulata*)

This is a soil borne disease of onion. Leaves of affected plants show distortion, thus the name onion twister.

Purple Blotch (*Alternaria porri*)

Onions affected by this disease exhibit small white sunken areas with purple centers on leaves. As the lesions enlarge, leaves dry out and collapse.

Downy Mildew

The first indication of a downy mildew is a fuzzy, violet covering on the outside of the leaf or stem – a symptom that is especially conspicuous when foliage is wet with dew one or two days later, the diseased portion of the leaf becomes pale green, then yellow, and finally they collapse.

Yellow Dwarf

This is a viral disease transmitted by aphids. Symptoms appear as a series of short yellow streaks, which appear at the base of the first leaf as it emerges through the neck of the bulb. Later, all symptoms show signs of the disease, but the leaves, which had developed, previously remain apparently healthy. The affected leaves later extend this to the flower stalks, which also show yellow streaks. These streaks coalesce, and the stalks become yellow throughout, and twisted and curled in a characteristic manner, which gives the plants a decidedly dwarfed appearance. Infected sets produce small bulbs of little commercial value.

Control Measures

The control of these diseases is better achieved through improved field sanitation, early planting, avoidance of flooded areas, proper row orientation, use of resistant varieties and finally spraying with chemicals.

Harvesting and Processing

Harvesting

As onions reach maturity, they cease to produce new leaves and roots, the food still present in the leaves moving into the bulbs under normal conditions, onions become soft at the neck when they mature, and the tops fall over. During this stage and immediately after, food materials are being transferred to the bulb, and as a result bulb increases rapidly in size. Therefore this stage must be allowed to be over before harvesting begins. However, the tops should not be allowed to dry completely because onions pulled green keep better in the store than those allowed to ripen off completely in the ground.

Bulbs that are harvested when they are too immature may take longer than others to dry properly for storage, and, if the necks are not yet soft, the inner leaves may still be growing and will continue to elongate from the topped bulbs, yielding an unsightly product.

Harvesting operations vary greatly, from hand pulling, without removal of either by or roots, to machine operations in which the bulbs are pulled, topped and moved from the field to storage without being touched by hand. In firm soils where pulling is difficult, the onion roots can be cut just below the bulbs by using a knife.

Onions are generally harvested by hand pulling. They are then laid on their sides for a number of days for further ripening in the open. If they do not lie on their sides, they tend to take root in wet weather and start growing again. Harvesting must be done in dry weather. Care should be taken not to bruise the bulbs so as to prevent rotting during storage.

Curing

Before onion bulbs are placed in storage or marketed, the tops are usually removed and frequently also the roots. Removal of the tops, especially of the necks are not dry, provides an open, moist surface where not organisms can easily enter. These neck tissues, and all other moist surface tissue of the bulb where not organisms might become established, should be carefully dried before infection can occur. This drying procedure is known as curing. In areas where the relative humidity is low and rains seldom occur during the harvest season, curing is easily and effectively done in the field storage.

After harvesting and curing, the onion crop is kept in storage regardless of the season they are produced. Many factors influence the storage life of an onion. Under all storage conditions, onion bulbs continually lose water and dry matter, but the more serious losses arise from storage roots and from sprouting and rooting. Among the factors which are critical for successful onion storage are: choice of cultivars, methods of culture, harvesting and curing, control of temperature and humidity in storage, design of storage structures, and use of sprout-inhibiting chemicals.

Onion storage structures vary from location to location, and also with the type of farmers. For large scale commercial farmers is the storage structures could be mechanical cold storage (refrigerated) while for most peasant farmers, the storage structures consists mostly of bamboo or wood stacks stuffed with grass. Ambient air is allowed to enter the storage structures. The onions could store for up to 6 months in these conditions.

Yield

Under good management practices as highlighted in this bulletin, yield of 10-12 tones per hectare could be obtained.

Summary

- Select good site
- Prepare land well
- Use certified and best variety seeds
- Use correct spacing
- Use the optimum seed rate
- Plant at the right time
- Use the recommended fertilizer rates
- Keep field weed free
- Control insect pests and diseases
- Harvest at the correct time
- Use good curing
- Select the best storage system.

Bibliograph

Currah, Lesley and Proctor, Felicity J. (1990). Onions in tropical regions. Natural Resources Institute Bulletin No.35

How to grow onions in Eastern Nigeria. Extension Guide. Ministry of Agric. Eastern Nigeria.

Guide to the production of onions. Extension Guide No.2. Ministry of Agric. Northern Nigeria.

Jones, H. A. and Louis K.M. (1963). Onions and their allies. Interscience Publishers Inc. New York.

Crop and Irrigation Water Management: Training Manual, NAERLS/CIRAD Project.

Rice, R.P; Rice, L.W. and H.D. Tindal (eds) (1986). Fruit and vegetable production in Africa. Macmillan Publishers.

Vegetable production training manual. AVRDC, Taipei Tariwan, 1990.

Amans, E. B. (1982). Growth and yield response of onion (*Allium cepa* L.) to varying levels of Nitrogenous and prophetic fertilizers. M. Sc. Thesis, Faculty of Agriculture, ABU, Zaria.

Yamaguchi, M. (ed) (1983). World Vegetables: Principles, production and Nutritive values. Ellis Hortwood Limited, Publishers, Chichester, England.



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