

# Exploration on Management Measures of Onion Production in Eastern Henan Province

Zhaojie XIAO\*

Shangqiu Academy of Agriculture and Forestry Sciences, Shangqiu 476000, China

**Abstract** In this paper, the management points and cultivation difficulties of onion in different stages were discussed in detail from the aspects of onion cultivation seasons, cultivation methods, sowing and seedling raising, proper planting, field water and fertilizer management, stalk removal period, pest control, timely harvest and so on. This paper provides theoretical guidance for the high quality and high yield of onion in Huang – Huai area and data reference for further improvement of high-yielding onion cultivation technique system.

**Key words** Onion; Cultivation; Huang – Huai area

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Onion (*Allium cepa* L.) is a biennial vegetable, which is eaten with fleshy bulbs and scales. Onion has become one of the main vegetable crops for adjusting the market demand and solving the vegetable blank in the off-season market in northern China because of its strong adaptability, transportation resistance and storage resistance. With the development of economy, people's demand for materials is not just about food and clothing, but more attention is paid to diet health on the basis of solving food and clothing. Onions are not only rich in protein, vitamins and other nutrients, but also has many functions such as sterilization, cardiovascular protection, cancer prevention and blood sugar lowering, and it has gradually gained the favor of the public, and its cultivation area has also expanded year by year. However, onion has different technical requirements from sowing to harvesting, and improper management in any period will affect the final yield. Therefore, this paper carefully analyzed various problems encountered in production and management priorities in each period, hoping to provide technical guidance for high quality and high yield of onion.

## Cultivation Seasons and Cultivation Methods

Onion seedlings grow slowly and occupy a long time, and the bulb formation period needs certain sunshine time and temperature, and it needs to avoid the hot summer season, so seedling raising and transplanting is the best choice. There are many ways to cultivate onion in production, but they are mainly divided into three types as below.

### Spring-sowing seedling raising method

In early spring, the temperature is low, so tomato seedlings need to be cultivated in hotbeds. When the seedlings have 3–4

leaves, they should be planted in the open field and harvested before the hot summer comes. The sowing date for spring-sowing seedling raising is generally two months before the local suitable planting period.

### Autumn-sowing seedling raising method

Sowing in autumn can give strong seedlings, and field planting is carried out in autumn of that year, or in the next spring, and onions are harvested in summer. The sowing date for raising onion seedlings in autumn is strict, that is, it is required to cultivate strong seedlings with a certain degree, and to prevent early bolting caused by excessive growth and development of seedlings before winter<sup>[1]</sup>. Sowing too early and too late will have a negative impact on the final yield. When sowing is carried out too late, onion seedlings are weak, and have cold resistance not strong during the wintering period, and the seedling mortality rate is high. And after planting in spring, the growth period is prolonged, the bulb development period is short, and the yield is reduced. When sowing is carried out too early, the seedlings are thick before overwintering, and the plants are prone to premature bolting in the next spring, which restricts the later expansion of bulbs and reduces the yield and quality.

### Small bulb method

Seeds are sown densely in the spring of the first year, and bulbs with a diameter of about 1.5 cm are formed in summer and stored after drying. The stored bulbs are planted in the spring of the next year. This method has higher yield, but the disadvantage is that the bulbs are not easy to store.

## Sowing and Seedling Raising

Loose, fertile and convenient neutral soil should be selected for sowing<sup>[2]</sup>, and the previous crop should not be onion and garlic. When preparing the soil, shallow ploughing and fine harrowing are required, so that the soil surface is fine and flat, and high-quality organic fertilizer which is fully decomposed is spread. The seedbed is sown with 22.6–46.0 kg of seeds per hectare, which can be used for 105 045 m<sup>2</sup> planting field.

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Zhaojie XIAO (1973–), male, P. R. China, assistant research fellow, devoted to research about vegetable physiology and breeding.

\* Corresponding author.

The soil is kept moist before unearthing the seedlings, and fertilizer and water conditions are properly controlled after the seedlings are unearthed. However, if the base fertilizer is insufficient and the seedlings are weak, topdressing should be combined with watering. When the height of seedlings is 3.5 – 4.0 cm, thinning and weeding are carried out to keep the distance between the seedlings in the range of 2.5 – 3.5 cm. When the height of seedlings is 15 – 17 cm and the diameter of pseudostems is 5.5 – 6.5 cm, transplanting is carried out.

## Transplanting at a Suitable Time

The field planting of onion is generally divided into two periods: spring planting and autumn planting. Spring planting should be carried out as early as possible, and planting can generally be done after the soil is thawed. When planting, seedlings with strong roots and vigorous growth are selected, and transplanted in stages according to the height of seedlings and the thickness of stem base. Onion seedlings can be densely planted, which is beneficial to increase the yield per unit area. The plant spacing and row spacing are 18 – 19 and 13 – 15 cm, respectively, and the planting density of yellow-skinned onion is higher than that of red-skinned onion.

Onion is a shallow-rooted crop suitable for shallow cultivation. If it is planted too deep, the leaves will grow vigorously, which will make the pseudostems thicker and affect bulb expansion. However, it should not be planted too shallow, because onion plants are prone to lodging when watering, which will affect seedling survival after planting, and will make the plants grow short and form bulbs prematurely. The bulbs will also be exposed because of planting too shallow, and they will easily change color and crack under sunlight, reducing the commodity rate. The specific planting depth is generally about 2 – 3 cm. At this time, the depth is just enough to bury small bulbs, and the plants can be buried slightly deeper in the case of sandy soil.

## Field Management

### Water management

Water has an important influence on biological growth, and insufficient water will seriously affect later yield and quality<sup>[3]</sup>.

Onion seedlings planted before winter grow slowly due to low temperature and small evaporation, so it is only necessary to water them once or twice after planting to ensure survival of seedlings, and irrigation should be controlled at other time. Before overwintering, overwintering water can be provided, and then seedlings can be covered with manure to protect the roots from freezing injury. In the second spring, after onion seedlings turn green, they should be watered in time to promote growth. In early spring, the temperature is low, and the evaporation and plant growth are small. In order to improve the ground temperature, before entering the peak period of leaf renewal, watering should not be too frequent, and intertillage should be done in time to preserve moisture, keep the soil loose and breathable and promote root growth. When entering the peak period of leaf growth, it is necessary to increase the amount and frequency of watering. Irrigation is performed for 1 – 2 times, 9 d before the bulb expands, and then deep ploughing and hardening of seedling are carried out to promote healthy growth of plants and lay a foundation for later bulb growth and development. In the bulb expansion period, the water demand is further increased. At this time, the soil should be watered frequently, and the watering time should be in the morning and evening to improve the yield and quality of onions<sup>[4]</sup>. Watering should be stopped one week before harvest to reduce the water content of bulbs and facilitate storage.

### Topdressing management

Onion seedlings planted before winter should be watered with fertilization, and the bulb yield can be significantly improved by topdressing<sup>[5]</sup>. As can be seen from Table 1, the experimental results showed that different amounts of  $K_2SO_4$  topdressing had great influence on the growth, quality and yield of onion. The leaf biomass, bulb sugar content, bulb quality and yield of onion could be significantly increased by topdressing  $K_2SO_4$ , and these indexes were on the rise with the increase of topdressing dosage. When the dosage of  $K_2SO_4$  was 300 kg/hm<sup>2</sup>, the leaf biomass, bulb sugar content, bulb quality and yield index values were the largest, and increased by 28.74%, 19.15%, 26.31% and 26.49%, respectively compared with the treatment without topdressing, indicating that topdressing potassium fertilizer was beneficial to onion yield<sup>[6]</sup>.

**Table 1** Effects of different topdressing amount on growth, quality and yield of onion

Treatment	Leaf biomass//g	Bulb sugar content//%	Bulb quality//g	Yield//kg/hm <sup>2</sup>
$K_2SO_4$ 0 kg/hm <sup>2</sup>	112.35 c	7.52 c	312.58 c	63 297.45 c
$K_2SO_4$ 150 kg/hm <sup>2</sup>	130.78 b	8.13 b	349.72 ab	70 818.31 b
$K_2SO_4$ 300 kg/hm <sup>2</sup>	144.64 a	8.96 a	394.81 a	80 067.47 a

### Picking stalks in time

If bolting plants are found in the field, the flower stalks should be removed in time to promote the sprouting of lateral buds into new plants and the formation of bulbs. If the flower stalks are picked too late, the bulb formation period will be delayed. Meanwhile, the flower stalks are hollow, and in case of rainy weather after bolting, it is easy to cause rot due to rainwater entering the

flower stalks, which seriously affects the yield of onion.

## Control of Diseases and Pests

### Key points of disease control

There are many onion diseases, but the main ones are downy mildew, white rot, rust, epidemic disease, gray mold and black spot<sup>[7]</sup>. The control methods are shown in Table 2.

**Table 2 Main diseases of onion and their control measures and drug application rate**

Disease	Agrochemicals	Application rate	Control times
Downy mildew	72.2% propamocarb aqueous solution	800 times dilution	Once per 5 d, 2–3 times continuously
White rot	50% carbendazim wettable powder	500 times dilution	Once per 5 d, 2–3 times continuously
Rust	20% triadimefon emulsifiable concentrate	1 000 times dilution	Once per 5–7 d, 2–3 times continuously
Epidemic disease	68% Ridomil Gold	1 000 times dilution	Once per 5 d, 2–3 times continuously
Gray mold	50% chlorphenazine wettable powder	1 500 times dilution	Once per 7–10 d, 2–3 times continuously
Black spot	75% chlorothalonil wettable powder	600 times dilution	Once per 7–10 d, 2–3 times continuously

### Key points of pest control

Onion pests mainly include root maggots and onion thrips. Root maggots can be sprayed with 1 000–1 500 times dilution of 48% chlorpyrifos EC once every 7–10 d at the initial stage of the disease, for 2–3 times continuously. Onion thrips should be sprayed with 3 000 times dilution of 5% Regent suspension or 2 500 times solution of 10% imidacloprid wettable powder once every 7–10 d for 2–3 times continuously during the peak period of nymph occurrence<sup>[8]</sup>.

### Timely harvesting

Onion harvest is generally before hot summer, and it can be extended to early autumn in areas without high temperature in summer. The harvesting period of onion is when the leaves turn yellow, the pseudostems are soft and begin to lodging, and the bulbs stop expanding and enter the dormant stage<sup>[9]</sup>. In order to facilitate transportation and storage in the later period after harvest, watering is stopped one week before harvest to reduce the water content of bulbs. Meanwhile, in case of rainy weather, harvest should be done in time before rain. If harvested after rain, onions will rot a lot, which will seriously reduce the yield. Onions should be harvested on a sunny weather as far as possible. After onions are dug out, they need to be dried in the field for 3–5 d, which is beneficial to the later storage.

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