

Onion (*Allium cepa L.*)

French: Oignon; Spanish: Cebolla; Italian: Cipolla; German: Zwiebel

Under Temperate Conditions

Crop data

Biennial normally grown as an annual. Harvested part: bulb.

Usually direct sown (or transplanted) and harvested when bulbs are dry and reach dormancy phase.

Root system is shallow and fibrous.

Cycle length is rather long and depends on cultivar and environment; bulb formation generally requires 12-15 hour long days and high temperatures.

Plant density: 20-40 plants/m²

Yields: 30-40 t/ha (85 % moisture).

Friable seed bed required. Optimum pH >6.0; some cultivars perform well up to pH 7.5.

Onions grow well in a wide range of temperatures, but generally best when cool during early development and warmer near maturity.

Nutrient demand/uptake/removal

For 30 t/ha yield, 116 kg N, 44 kg P₂O₅, 144 kg K₂O, 20 kg MgO, 131 kg CaO, per ha.

For yield of about 40 t/ha, 160 kg N, 76 kg P₂O₅, 115 kg K₂O, 16.6 kg MgO, 128 kg CaO, per ha.

Although 50 % of uptake of the three major nutrients occurs during the last month before harvesting, the effect of N on growth and yield depends on its influence on the relative growth rate in the very early stages. Pungency of flavour is enhanced by fertilizers containing S but diminished by N in ammonium form.

Plant analysis data

Satisfactory N level in older leaves 2-3 % on dry matter basis; critical tissue level for N in younger, fully expanded leaves about 5 %.

Fertilizer recommendations

100-200 kg N, 100-200 kg P₂O₅, 200-300 kg K₂O per ha, commonly recommended, with 20-40 kg/ha MgO for high-yielding crops (K₂O dose may vary according to soil status). Trials in Europe have shown yield increases with up to 110-120 kg/ha N and 200 kg/ha P₂O₅. N application should be divided into two or three dressings (before sowing or planting, at the fully expanded leaf stage, and just before bulbification). Some experiments have shown the best results with slow-release N fertilizers.

Due to the shallow root system the fertilizers should be banded 8-10 cm below the seed row. P₂O₅ and K₂O topdressings can prove useful on soils poorer in these nutrients. High nutrient availability is important during bulbification; in this phase a high K:N ratio is required.

Onions are very sensitive to Mg deficiency which causes chlorosis on alkaline soils. Zn, Mo and Cu may also present problems. Cu deficiency causes thin, poorly coloured bulb scales and impairs keeping quality.

Under Tropical/Subtropical Conditions

Crop data

Usually transplanted in the tropics. Harvested 90 - 150 days after planting. Plant density: 66 000 to 500 000 plants/ha. Grown in soils ranging from light sandy to organic with a pH range of 5.8 - 6.5 adapted to cool weather (15 - 20 °C) and low humidity.

Target marketable yields in intensive commercial production: 30 - 45 t/ha.

Nutrient demand/uptake/removal

Nutrient uptake/removal - Macronutrients					
Yield t/ha	N	P ₂ O ₅	K ₂ O	MgO	CaO
kg/ha					
41	102	41	112	17	29
Source: various					

Plant analysis data

Plant analysis data - Macronutrients (optimum fertility conditions)					
Plant part	Growth stage	% of dry matter			
		N	P	K	Mg
Young mature leaf	Mid season	3.1	0.33	3.3	0.27
Source: various					

Plant analysis data - Micronutrients (optimum fertility conditions)					
Plant part	Growth stage	ppm dry matter			
		Fe	Mn	Zn	Cu
Young mature leaf	Mid season	10	27	7	0.73
Source: various					

Fertilizer recommendations

The unbranched root system is very inefficient in P uptake unless the root is mycorrhizal. Cu deficiency is common in peaty and acid soils; acid soils should be limed, since the crop does not tolerate acidity well. Mn deficiency may occur in alkaline soils.

All fertilizer should be applied close to the surface to be within reach of the shallow root system. A complex fertilizer, rich in P₂O₅ (e.g. 12-24-12) will improve bulb enlargement and yields. Even when mineral fertilizers are used, additional application of organic manure may enhance yields, quality and bulb size.

Present fertilizer practices

Senegal (Camberene)

In a light sandy soil in a semi-arid area apply 10 t/ha of organic matter, 55 kg/ha N, 125 kg/ha P₂O₅, and 140 kg/ha K₂O. Broadcast all the organic manure (well-decomposed) and three-quarters of the N, P₂O₅ and K₂O before planting, and band the remainder 35 days after planting.

Philippines (Los Banos)

Apply 120 kg/ha N, 240 kg/ha P₂O₅, and 120 kg/ha K₂O in the dry season. At planting apply all the P₂O₅ and K₂O and half the N as a basal dressing. The remaining half of N is sidedressed when bulbing is initiated. Sidedress about 10 cm deep and 8 cm away from the roots.

Pakistan (Baluchistan Province)

Apply 120 kg/ha N, 80 kg/ha P₂O₅ and 80 kg/ha K₂O. All of the P₂O₅ and K₂O and half the N are applied at transplanting, and the remaining N 4 weeks later.

Nigeria (Nsukka)

In acid ultisols apply 2 t/ha CaO at least two weeks before transplanting. At twenty days after transplanting apply 75 kg/ha N, 70 kg/ha P₂O₅, and 180 kg/ha K₂O. At 35 days after transplanting apply a further 75 kg/ha of N.

Further reading

ASIEGBU, J.E.: Response of onion to lime and fertilizer N in a tropical ultisol. *Trop. Agric.* 66, 161-166 (1989)

GAMIELY, S. et al.: Onion plant growth, bulb quality, and water uptake following ammonium and nitrate nutrition. *HortScience* 26, 1061-1063 (1991)

SAIMBHI, M.S.; RANDHAWA, K.S.: Influence of N, P and K on the yield and processing quality of onion bulbs. *Vegetable Sci.* 10(2); 73-76 (1983)