Okra *(Abelmoschus esculentus [L.] Moench.)*

French: Gombo; Spanish: Ocra; Italian: Gombo; German: Okra

Under Tropical/Subtropical Conditions

Crop data

This is an important vegetable in tropical and subtropical areas. In the tender stage it is very nutritious and the season of availability for use is long. Young leaves and tender pods are eaten. The crop is cultivated either alone or in mixed culture with other crops. It is one of the most important vegetables in India, and in Nigeria alone it occupies 1.5 million hectares.

It requires a temperature of at least 16° C for germination. Temperatures of 20 to 30° C are appropriate for production. The crop will do well on soils ranging from sand to clay if both internal and surface drainage are good and soil fertility is maintained. Although okra is tolerant to some drought stress, supplementary irrigation is necessary for good production during extended drought.

Plant population densities from 16 000 to > 100 000 plants per hectare may give ever-increasing yields if all growth factors are abundantly supplied. However 40 000 plants/ha will produce near maximum yields if the plants are well spaced.

Although the yield potential is high (30 - 40 t/ha have been reported), actual yields are usually low because improved methods of production are exceptional rather than the rule and because many areas where the crop is grown are subject to extremes of weather which make yield prospects uncertain.

Nutrient demand/uptake/removal

Nutrient uptake/removal* - Macronutrients					
Plant part / yield	**kg/ha**				
	N	**P2O5**	**K2O**	**MgO**	**CaO**
Pods, 20 t/ha	79	32	89	15	29
Total plant**	200	73	156	45	38
* Based on data of Majanbu et al., 1986; Ahmad & Tullock-Reid, 1968 and FAO. ** Assumed that pods represented 45 % of total dry weight and that composition of vegetative parts was equal to leaves composition at 15 weeks after harvest.					

Plant analysis data

The table gives the nutrient concentration in leaves and pods in approximate 20 t of harvested product.

Plant analysis data* - Macronutrients					
Plant part	**% of dry matter**				
	N	**P**	**K**	**Mg**	**Ca**
Leaves 15 weeks	4.1	0.35	1.9	0.62	3.2
Pods 8 weeks	3.3	0.60	3.1	0.38	0.7**

N-fertilizer application = 100 kg/ha N

* Based on data of Majanbu et al., 1986; Ahmad & Tullock-Reid, 1968; and FAO.

** FAO, 1968; assumed pods 12 % dry matter.

Fertilizer recommendations

Reliable general recommendations concerning practices cannot be made for two reasons; (1) environmental conditions, including soil factors, are so varied that generalizations will seldom if ever apply precisely, and (2) quality research upon which to base such generalizations is almost totally lacking. As a gross generalization it may be said that the requirement is similar to that of cotton.

The table below presents a few examples of fresh pod yields and leaf composition associated with various yield levels. Footnotes to the table suggests the conditions where these recommendations may apply. For example, recommendations in Brazil are based on soils of medium nutrient status. For soils low in P and K the recommendation is increased by 50 %, whereas for soils high in P and K recommendations are reduced by 50 %.

Generally, adjustments are necessary for fertilizer use efficiency and nutrient contributions from the soil, manure, residual fertilizers etc. As a first approximation, the efficiency of N fertilizer use is 50 % and many soils will deliver approximately 80 kg/ha N. Thus for a 20 t okra crop, the estimated N fertilizer requirement would be (200 - 80) / 0.5 = 240 kg/ha N, which was the N level employed for estimated maximum yield in South India (Bangalore). The P is applied at planting, together with 25 % of the N and 60 % of the K, followed by two applications of N and K2O approximately 20 and 40 days after seedling emergence.

Approximate okra yields (green pods), and N, P and K concentrations in leaves associated with various fertilizer rates						
Yield level (tons/ha)	**Leaf composition (% of dry matter)**			**Fertilizer rate (kg/ha)**		
	N	**P**	**K**	**N**	**P2O5**	**K2O**
	South India (Bangalore) 1)					
100 % predicted	4.0	0.31	2.6	240	172	288
80 % actual (6.5)	3.35	0.31	2.3	240	172	144
75 % (5.1)	3.3	0.29	2.25	120	0	144
50 % (4.1)	2.85	0.27	1.75	60	0	36
25 % (2.0)	<2.7	-	-	0	0	0
	Trinidad 2)					
100 % (16.5)	5.1	0.40	2.5	112	385	300
	Sao Paulo, Brazil 3)					
General recommendation for soils or medium P and K status	-	-	-	80	202	140
	Northern Nigeria (Samaru) 4)					
100 % (6.2)	4.13	0.35	1.88	100	30	40
	Southeast USA (Georgia and Florida) 5)					
General recommendations for soils very low in P and K	-	-	-	120	160-275	60-149

1) Data based on a graphic reexamination by one of the authors (RLF) of results presented by Kumar & Devarajura, 1988; using a boundary-line approach with some extrapolation.
2) Based on data by Ahmad and Tullock-Reid, 1968; with some obvious corrections. The soil is micaceous but with only 0.13 meq/100 g exchangeable K; thus K fixation accounts for high K fertilizer requirement.
3) Extracted from Van Raij et al., 1985; recommendation based on a soil of medium extractable P and K status but relatively high in P sorption capacity.
4) Extracted from data by Majanbu et al., 1985 & 1986. Soils averaged 0.2 meq exchangeable K and P sorption was low. Low P fertilizer rate was adequate but K fertilizer rate was insufficient for high yields, whence the low leaf K.
5) Composite fertilizer recommendations Hochmuth & Hanlon, 1989; Woodruff, 1927. The range represents greater P sorption by Georgia soils and greater K leaching by Florida sands.

Further reading

AHMAD, J.N.; TULLOCK REID, L.I.: Effect of fertilizer nitrogen, phosphorus, potassium and magnesium on yield and nutrient content of Okra (Hibiscus esculentum L.). Agron. J. 60, 353-356 (1968)

MAJANBU, I.S.; OGUNBLA, V.B.; AHMED, M.K.: Response of two okra varieties to fertilizer: growth and nutrient concentrations as influenced by nitrogen and phosphorus application. Fertilizer Res. 8, 297-306 (1986)