Tropical Pulse Crops

Crop data

Pigeonpea *(Cajanus cajan (L.) Millsp.)*

French: Ambrevade, pois d'Angole; Spanish: Arveja de Angola, guandul; Italian: Pisello d'Angola; German: Taubenerbse

Perennial in habit but cultivated as an annual crop.
Harvested part: pods.
Generally sown at the beginning of rainy season (direct seeding). Post rainy season planting also successful in eastern India and Nepal.

Flowers 2 to 6 months after sowing. Harvested 4 to 10 months after sowing.

Plant density 100 000 plants (traditional) to 300 000 plants (intensive) for short-season cultivars and 50 000 plants (traditional) to 80 000 plants (intensive) for long-season cultivars as sole crop. In intercropping systems, 40 000 plants per ha for long-season cultivars.

Preferably grown on Entisols, Vertisols and Inceptisols, pH 5.5 to 8.0

Adapted to tropical and sub-tropical environments. Long-season cultivars generally grown as a rainfed crop but short-season cultivars are irrigated.

Urdbean *(Vigna mungo (L.) Hepper)*

French: Haricot velu; Italian: Fagiolo Urd; German: Linsenbohne

and

Mungbean *(Vigna radiata (L.) Wilczek)*

French: Amberique; Spanish: Judía de Mungo; Italian: Fagiolo Mungo; German: Mungobohne

Annual. Harvested part: pods.
Generally sown at the beginning of a rainy season (direct seeding); also at end of rainy season (South east Asia) and in spring/summer and late winter (India).

Flowers 1 to 2 months after sowing. Harvested 2 to 4 months after sowing.
Plant density 200 000 plants (traditional) to 300 000 plants (intensive) per ha for rainy season crop and 600 000 to 800 000 plants per ha for spring/summer crop.

Preferably grown on Vertisols, Entisols and Alfisols, pH 5.5 to 8.5.

Well adapted to tropical and sub-tropical environments. Rainy season crop generally unirrigated but spring/summer crop is essentially irrigated.

Cowpea *(Vigna unguiculata (L.) Walp.)*

French: Dolic asperge; Spanish: Judía espárago; Italian: Fagiolino asparago; German: Spargelbohne

Annual. Harvested part: pods.
Sown at the beginning of a rainy season, post-rainy season and spring/summer (direct seeding)

Flowers 1 to 2 months after sowing. Harvested 2 to 4 months after sowing
Plant density 200 000 plants/ha (traditional) to 300 000 plants (intensive) per hectare for rainy season crop and 400 000 plants per ha for spring/summer crop.

Preferably grown on Vertisols and Entisols, pH 5.0 to 8.0.

Adapted to arid to sub-humid tropics. Rainy season crop unirrigated but spring/summer crop is essentially irrigated one.

Nutrient uptake/demand/removal

Nutrient uptake/demand - Macronutrients								
Crop	**Yield t**	**Source**	**kg/ha**					
			N	**P2O5**	**K20**	**MgO**	**CaO**	**S**
Pigeonpea	2.0	Ahlawat, 1980	93.5	25.4	65.6	-	-	-
	1.2	Aulakh et al, 1985	85.0	18.3	75.0	24.9	32.2	9.0
	3.1	Dalal & Quilt, 1977	318.0	98.4	130.8	98.0	-	48.0
Mungbean	0.7	Kothari, 1984	91.9	12.8	83.6	-	-	-

Nutrient uptake/demand - Micronutrients						
Crop	**Yield t**	**Source**	g/ha			
			Fe	**Mn**	**Zn**	**Cu**
Pigeonpea	1.2	Aulakh et al, 1985	1 440	128	38	31

Plant analysis data - Macronutrients									
Crop	**Stage**	**Plant part**	**Source**	**% of dry matter**					
				N	**P**	**K**	**Mg**	**Ca**	**S**
Pigeonpea	Maturity	Leaf	Singh et al, 1978	1.96	0.25	-	-	-	-
		Shoot		1.02	0.13	-	-	-	-
		Grain		3.52	0.51	-	-	-	-
				Optimum concentration:					
	40-50 DAS	Whole shoot	Burton & Edward, 1981 Nicholas, 1965, Rosbrook & Edward, 1981 Sheldrak & Narayanan, 1979	4.0 (0.3)*	0.35-0.38 -	1.2-2.6 (0.78)	0.28 (0.17)	1.32 (0.84)	0.16-0.32 -
Urdbean	30 DAS	Whole plant	Pareek et al, 1978	3.67	0.32	1.74	-	2.4	0.33
				Optimum concentration:					
	45-50 DAS	Whole shoot	Dwivedi & Randhawa, 1974 Nowlan, 1980 Dange et al, 1964	3.6 (3.3)*	0.38 (0.28)*	- -	- -	- -	- -
Mungbean	Maturity	Grain	Dhama, 1982	3.75	0.46	-	-	-	-
		Straw		1.48	0.28	-	-	-	-
Cowpea	60 DAS	Shoot	Venkat Reddy & saxena, 1983	1.60	0.36	3.94	-	-	-
		Leaf		3.89	0.40	2.10	-	-	-
				Optimum concentration:					
	45 DAS	Whole shoot	Fox et al, 1977 Kashirad et al, 1978	2.76 (2.4)	0.27-0.35 (0.19-0.24)	- -	- -	- -	0.35-0.60 -
* Values in parantheses indicate the critical limit									

Plant analysis data - Micronutrients								
Crop	Stage	Plant part	Source	ppm dry matter				
				Cu	Zn	Mn	Fe	B
Pigeonpea	45-50 DAS	Whole shoot	Burton & Edward, 1981 Nicholas, 1965, Rosbrook & Edward, 1981 Sheldrak & Narayanan, 1979	Optimum concentration				
				12 (10)	48 (10-13)	19-95 (18)	151-191 (151)*	10-52 (10)
Urdbean	45-50 DAS	Whole shoot	Dwivedi & Randhawa, 1974 Nowlan, 1980 Dange, et al, 1984	- -	18 (14-15)	- -	- -	>20 -
Cowpea	45 DAS	Whole shoot	Fox et al, 1977 Kashirad et al, 1978	Optimum concentration:				
				- -	27-32 (18-24)	1000 (280)	(>100) (<70)	- -
* Values in parentheses indicate the critical limit.								

Fertilizer recommendations

Most tropical pulse crops are grown on marginal soils poor in fertility. The traditional practice is to apply small amount of organic manures with little or no mineral fertilizer. For sustained productivity, adequate and balanced fertilization is required.

Acidic soils of Indian Sub-continent and South-east Asia need liming at 2-4 t/ha to raise soil pH.

Phosphorus is the most important fertilizer nutrient for tropical pulses. As leguminous crops, they can obtain most of their nitrogen requirement by symbiotic N fixation. Response to potassium is generally small on account of the high available K status of the soils on which they are grown. On light sandy soils, chickpea and pigeonpea have responded to sulphur at 10-20 kg/ha S. On calcareous soils in northern India pulse crops showed a good response to a basal application of 20-25 kg/ha Zn SO4 or a foliar spray of 5 kg/ha Zn SO4. Iron chlorosis which can be corrected by a foliar spray of 0.5 % FeSO4, has also been observed in pulses growing on calcareous soils. Pigeonpea grown on Alfisols and Entisols has benefited from a basal application of 1 kg sodium molybdate and 10 kg borax per hectare.

General fertilizer recommendations			
Crop	**Time of aplication**	**Application rate kg/ha**	
		N	**P2O5**
Pigeonpea	All basal	20-30	40-80
Urdbean and Mungbean	All basal	10-20	30-60

Preferred nutrient forms

In the climatic and edaphic conditions in which tropical pulses are grown, the fertilizer nutrients should be applied in easily available form: N preferably as ammonium, P in water-soluble form and K as sulphate.

Current fertilizer practices

Indian Sub-continent (pigeonpea, urdbean and mungbean)

Generally in rainfed areas no fertilizers or manures are applied; in some places farmers may apply a small amount of f.y.m. (e.g. 8-15 t/ha) 3-4 weeks before sowing. In irrigated areas, a small amount of mineral fertilizer (10-15 kg/ha N, 20-30 kg/ha P_2O_5) is either placed in the seed furrow or broadcast and mixed in.

Under improved cultivation practices: irrigated, basal application of 18-20 kg/ha N, 40-50 kg/ha P_2O_5, plus K, Zn, S if required; unirrigated, basal application of 10-15 kg/ha N, 20-30 kg/ha P_2O_5, followed by a foliar spray of 2 % urea at pod development.

Diammonium phosphate, urea and single super phosphate are commonly used.

South East Asia (mungbean, urdbean)

Mostly grown without fertilizer. Organic manures, too, are seldom used. Acidic soils are limed to correct pH.

Under improved cultivation systems: basal application of 10-15 kg/ha N, 30-40 kg/ha P_2O_5, 20-30 kg/ha K_2O; and for acidic soils lime at 2.5 t ha.

Australia (mungbean, cowpea, pigeonpea)

Phosphatic and potassium fertilizers at 40-60 kg/ha P_2O_5 and 30-40 kg/ha K_2O as a basal dressing.

Africa (cowpea, pigeonpea).

Generally no fertilizer is applied. Under improved cultivation systems: basal application of 10-20 kg/ha N and 30-40 kg/ha P_2O_5.

Further reading

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