Tropical Animal Production 1983 8:153-156

EFFECT OF PLANTING DENSITY OF THE SEED YIELD OF CANAVALIA ENSIFORMIS

F Herrera G

Facultad de Medicina Veterinaria y Zootecnia, Universidad de Yucatán Apartado 116-D, Mérida, Yucatán, México

The yield of *Canavalia ensiformis* seed in the stoney soils of Yucatan, Mexico was measured for 5 densities of sowing (5, 2.5, 1.67, 1.25 and 1.0 plants/m^2). There was a quadratic relationship between yield and plant density and under the conditions of the trial (seasonal planting without fertilisers) a maximum yield of c 1900 kg seed/ha can be expected with a density of 35,000 plants/ha.

Key Words: *Canavalia ensiformis*, Jack bean, seed yield, plant density

Canavalia ensiformis (also known as Jack bean) is a legume which is to be found in the tropics and subtropics of both hemispheres (Skerman 1977). It gives satisfactory yields under extreme conditions and is resistant to insect attack and to diseases. The plant grows well on poor soils and germinates very rapidly (in 48 to 72 hours). Its major limitation is its content of 4 toxins (urease, canavanina and co-canavalina (A and B), which limit the level at which one can use untreated plant in livestock rations (up to approximately 10% in diets for monogastrics and 30% in diets for ruminants).

The compositions of seed and forage are given in Table 1, while seed and forage yields of canavalia reported in a revision by Mora (1979) are set out in Table 2.

In Yucatán, México, two factors suggest the use of this plant. The poultry industry, is presently going through a critical period due to the high cost and scarcity of feed ingredients such as sorghum and soya. Soya recently increased in price by about 50%, bringing about a decapitalization, closure of some farms and the survival of only the larger enterprises, giving rise to a virtual monopoly in the poultry industry. Locally produced Canavalia could replace part or all of the soya inpoultry rations. The other reason is that the henequen zone has always depended basically on the monoculture of henequen (*Sisal fourcroides*). However, in the last few years, due to the competition from synthetic fibres derived from petroleum, the world demand and consequently the production of henequen have diminished, which has made it necessary to look for alternative crops for the henequen zone. There are however few crops suited to the difficult prevailing conditions, which include extremely rocky soils, high temperatures and the poorly distributed rainfall. *Canavalia ensiformis* has production characteristics and ecological tolerances, which make it a strong candidate crop for the region. In order to test its suitability, a trial was carried out in which the effect of different planting densities was evaluated on the production of seed.

Table 1:

Proximate analysis of the forage and seed of Canavalia ensiformis

	Fresh forage	Seed (1)	Seed (2)
Dry matter (DM) %	23.2	91	91
DM composition,%			
N x 6.25	23	34	33
Crude fibre	27	11	8
Ether extract	2	2	2
Nitrogen free extract	36	50	54
Ash	12	3	3
Ca	-	0.1	0.5
P	-	0.4	0.6

(1) Skerman 1977; (2) This work

Table 2:

Seed and forage yield of Canavalia ensiformis *reported by Mora (1979)*

Plant spacing (m)	Plant density (plant/ha)	Seed yield (kg/ha)
Seed		
1.50 x 0.60	11,111	6,200
1.50 x 0.30	22,222	8,600
1.50 x 0.15	44,444	10,000
0.6 x 0.6	33,333	6,910
Forage[1]		
0.80 x 0.20	62,500	20,761
0.80 x 0.40	31,250	10,173

[1]Forage yield (fresh) at 150 days

Materials and Methods

A 5 x 5 latin square experimental design was used, and treatments were:

(A) Five plants/m^2

(B) 2.5 plants/m^2

(C) 1.67 plants/m^2

(D) 1.25 plants/m^2

(E) 1.0 plant/m^2

The trial was carried out on 1 ha of land divided into 25 plots, each with an area of 400 m^2.

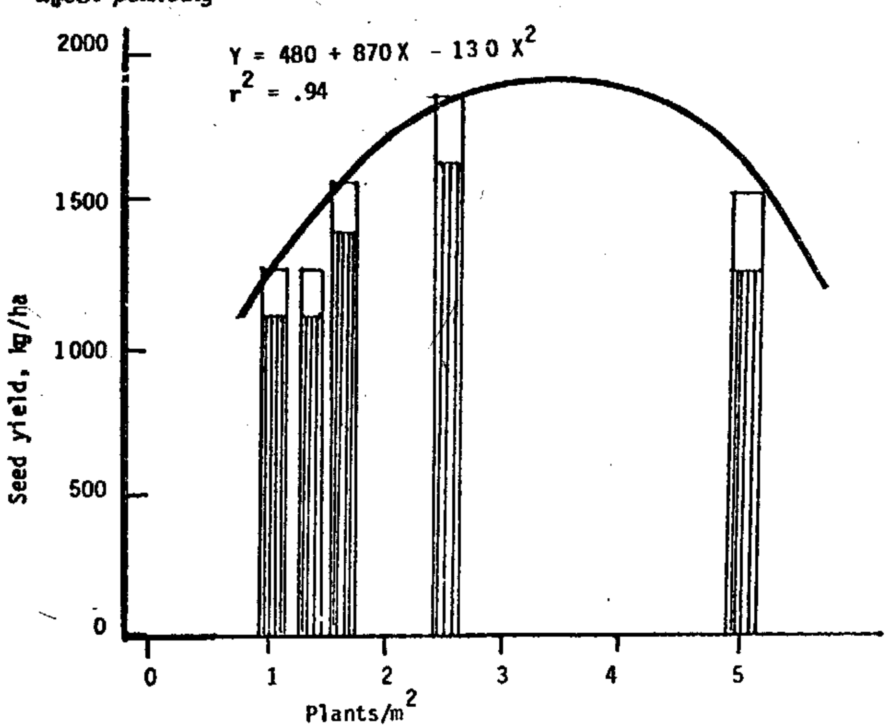
Land preparation before plantin g consisted only of a manual slashing by machete. The land was not ploughed. The trial was planted at the beginning of the rains (June 1981), planting one seed only per planting hole. Post-planting management consisted of two separate slashings. The trial was not fertilized or irrigated. The soil was very stoney, being covered with calcareous rock with very good drainage and a pH of 7 - 7.5. The average annual rainfall for the area is from 800 - 900 mm/yr.

Results and Discussion

The germination percentage was 87.7%. Pods were harvested at 6 months after planting (in December 1981), and later a second harvest was taken at 10 months after planting (April 1982). The percentage of seed harvested in hte second harvest compared to the first was only 14.6%. The results of the trial are presented in Table 3 and in Figure 1.

The results from the literature (see Table 3) record higher yields of seed than those encountered here (Mora 1979), but this was probably due to different ecological conditions. Data from the literature also indicate that there exists a poor balance between calcium and phosphorus in canavalia seed, but our results do not show this, possibly because the soil was highly calcareous.

Figure 1:
Effect of plant population density on seed yield of canavalia at 6 (lined part of columns) and 10 (total height of columns) months after planting



It can be seen from the graph (Figure 1) that there was a quadratic response in yield to increase in plant density, and the maximum yield (approximately 1900 kg/ha) would be expected from a density of 35,000 plants/ha.

Conclusions

Canavalia ensiformis appears to be an attractive alternative for the henequen zone of the Yucatan Peninsula as one could expect a yield of around 1,800 kg of seed/ha from a rain-fed crop without fertilization. There also exists the possibility of planting canavalia between the rows of henequen in the henequen estates.

References

Mora M 1979 Revisión general de literatura sobre *Canavalia ensiformis*, Río Negro, Venezuela (datos no publicados)

Skerman P J 1977 Tropical Forage Legumes Plant Production and Protection Series No. 2 FAO, Rome

Received June 7, 1983