Research Note

UTILIZATION OF PIGEON PEA (Cajanus cajan) *BY-PRODUCTS AS FEED FOR BEEF CATTLE*[1, 2]

Pigeon pea (*Cajanus cajan* Mill spp.—"gandur or gandul") is a legume that produces high yields of grain and foliage. One ha produces about 2300 kg of grain and the same amount of hulls. The leaves in the upper part of the plant can also be used as roughage for cattle, goats, sheep, and horses.

In Hawaii, the bush, grain, and hulls are used as fresh or dried feed ingredients for cattle and other farm animals. Krauss[3] reported maintaining from 1 to 5 animals/ha with an average weight gain per animal of 0.4 to 0.5 kg/d (1.0 to 1.1 lb/d) in good pigeon pea pastures where the bushes were planted at close intervals (a gain similar to that expected in Puerto Rico by the average cattleman when beef animals are fed only improved tropical well-managed pasture). Krauss also reported that the green bush contained approximately 70% moisture, 7% crude protein, 11% crude fiber, 8% N-free extract, 2.5% ash, and 1.5% fat. In Australia[4] the bush is used during the dry season for grazing in arid zones, as a maintenance feed to delay weight loss until better forages become available.

In Puerto Rico, Olivencia[5] reported in 1937 that 1 ha of land would produce as much as 2,900 kg of dried forage (hay) per harvest, if only the upper third of the bush were clipped and used. Mature bushes had about 60% dry matter. He felt that this yield could be triplicated with three harvesting operations (every 4 mo) per year. Abrams[6] reported green-pod yields of approximately 6,000 kg/ha in one harvest.

Several experimental and commercial pigeon-pea plots (of several hectares each) were mechanically planted with different varieties at distances of 0.6 m between rows and 25 to 30 cm within rows. All the

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[3] Krauss, F. G., 1932. The pigeon pea (*Cajanus indicus*), its improvement, culture and utilization in Hawaii, Hawaii Agric. Exp. Stn. Bull. 64.

[4] Pigeon pea (*Cajanus cajan* (L.) Mill spp.) research in Australia, pp. 149–66, International Workshop on Grain Legumes, Int. Crops Res. Inst. for the Semi-Arid Tropics, India, Jan. 1975.

[5] Olivencia, P., Sr., 1937. Breves datos sobre henificación de gandules, Rev. Agric. P.R. 28: 787–8.

[6] Abrams, R., January 1975. The status on pigeon pea research in Puerto Rico, pp. 141–7, International Workshop on Grain Legumes, Int. Crops Res. Inst. for the Semi-Arid Tropics, India.

grain was collected by hand (most leaves remaining) before the phase described in this report.

The authors observed that when pigeon-pea bushes were harvested with a forage-cutter harvester, the highest the cutter could be adjusted was 30 cm from the soil surface, so in the first forage crop, when the bushes were about 1 year old, a considerable proportion of woody stem and highly fibrous branches were harvested together with the leaves. Naturally, this mature bush had high fiber, lignin, and silica contents, all of which lowers the digestibility of the forages.

An almost perfect regrowth resulted with the B-2 Bushy experimental line when the bushes were cut with a chopper with sharpened knives. With the Kaki cultivar, whose stem is thicker, even with sharpened knives the regrowth was not as high as with the thin-stem varieties. In many instances, particularly when it rained immediately after the chopping process, a fungus developed in the physically-damaged exposed thick stem and the bush died.

In the cases where regrowth was obtained, successive cutting at the same height at 6- to 8-week intervals resulted in practically all-green low-fiber-content material. The consecutive regrowths of these varieties after the grain harvest, from about March until early September, when the new crop was to be planted, appeared to offer a possible alternate productive utilization of land that would otherwise be idle. Furthermore, a large planting that was chopped several times, was let alone after October, and an additional crop was obtained, although it was smaller than that of the first year. Assuming three regrowths, each producing over 3 t/ha of a highly nutritious forage, approximately 10 t/ha of additional forage would be produced in an arid area where drought conditions predominate throughout most of the year and not many other forages are available. This would be enough to support 1.5 adult cattle/ha for approximately 5 mo. The possibility of obtaining an additional crop the second year should be evaluated further, particularly in terms of varieties best suited for the dual purpose of grain and forage production.

Excellent quality silage was prepared by adding as little as 5% by weight of either cane molasses or 55°Brix concentrated sugarcane slops, or a combination of both, to either pigeon-pea hulls or foliage. Animal acceptance of the hull silage was higher than that for bush silage with no refuse. Bush silage contained a high percentage of fibrous stems, which were either left or pushed out of the troughs by the animals, together with some of the edible good quality material.

Producing hay by drying the hulls in the sun in layers not thicker than 10 cm over a concrete floor (batey) for 2 to 3 consecutive days in an arid-hot zone (Boca Chica, Juana Díaz, P.R.) resulted in an excellent product of lasting keeping quality that was easily stored afterwards. Making

foliage hay under similar conditions was not an easy process to follow, considering that the mechanically-chopped material used contained a high proportion of stems which made it hard to handle in the twice-a-day turnover required for proper homogeneous exposure to sunshine.

Table 1 shows the chemical analysis of different portions of the pigeon pea plant.

A feedlot operation was established by Sucesión John Serrallés, Inc., at Boca Chica farm, Juana Díaz, Puerto Rico. Twenty Charbray and 20 Brahman bulls, 6 to 8 mo old were originally fed pigeon-pea hulls (fresh and dried) from January until March, a time that coincides with the peak of the dry season. Fresh pigeon-pea foliage was fed afterward. Excess available hulls were dried and stored. This hull hay was offered to the animals intermittently with the fresh foliage, when the latter could not be chopped or delivered on time. Table 2 shows the results obtained.

The growth rate of Brahman bulls was, as expected, below that of Charbray bulls. The weight gain of the latter was only 60% as high as that reported by Krauss,[3] in whose experiments pigeon-pea bush with grain was available and the animals probably ate the less-fibrous portions. Abrams[5] reported that dried pigeon peas contain approximately 21% crude protein. It may be that the difference in weight gain between present observations and those of Krauss[3] are due to pod consumption, which is higher in protein and lower in fiber content. These data are not comparable, considering the selectivity option available in browsing the

TABLE 1.—*Chemical analysis of several byproducts of the pigeon pea plant*

Material	Dry basis				
	Crude protein	Humidity	Crude fiber	Ca	P
			%		
Chopped mature whole bush (without grain)	10.1	—	34.5	—	—
Chopped young whole bush hay (without grain)	16.8	2.1	—	—	—
Fresh hulls	10.9	—	23.2	—	—
Hull silage	5.6	20.1	—	0.52	0.04
Chopped young bush silage	14.9	57.2	—	.58	.07

TABLE 2.—*Mean weight of animals fed pigeon pea hull hay and fresh foliage*

Animal	Days of trial	Mean weight							
		Starting		Final		Net gain		Ave. daily gain	
		kg	*lb*	*kg*	*lb*	*kg*	*lb*	*kg*	*lb*
Brahman (Zebu)	163	196	432	225	496	29	64	0.18	0.39
Charbray	227	204	449	263	578	59	129	.26	.57

bushes. More detailed evaluations are justified, particularly to try forcing a higher consumption of the chopped roughage without grain. Preparing pellets containing small amounts of other low-cost ingredients that may increase palatability and intake may be considered as an alternative.

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