

Production of Cassava Foliage

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Investigations were carried out on the production of foliage from cassava for use as protein in animal feed. The best results were obtained with successive cuttings of foliage at intervals of 3–4 months with plant densities of 31 250 and 15 625 plants/ha. The production rates obtained were: 14.5 t/ha of dry foliage in 12 months during the dry season, 19.6 t/ha in 12 months during the rainy season, and 35.2 t/ha in 17 months during the rainy season. The protein content of the material (stems, branches, and leaves) varied between 13.8 and 22.3% with a maximum protein yield of 2.7 t/ha per year.

The blades of the cassava leaf have a protein content of about 25%. This makes the crop a rich and cheap source of protein, which may be substituted for alfalfa foliage meal and other protein sources that are difficult and costly to obtain. Plant densities, crop management, and protein content of the total foliar mass were studied because little published information is available on these subjects.

Methods and Materials

Cassava variety Cacho de Toro Amarga (UCV-2078) was planted in a split plot design with three replications at Maracay, Venezuela. No chemical fertilizer, manure, or lime was applied to the soil.

Plant densities were changed by varying the spacing within the rows, which were 80 cm apart. The densities were: (1) 31 250 plants/ha (40 cm between plants); (2) 15 625 plants/ha (80 cm between plants); and (3) 10 412 plants/ha (120 cm between plants).

Three different harvesting frequencies were used in the dry season: (1) foliage (leaves, branches, and stems) at 4, 8, and 12 months (3 harvests) and roots at 12 months; (2) foliage at 8 and 12 months (2 harvests) and roots at 12 months; and (3) foliage at 12 months (1 harvest) and roots at 12 months. Three harvest schedules were also used during the rainy season: (1) foliage at 3, 6, 9, 12, 14, and 17 months; (2) foliage at 6, 9, 12, 14, and 17 months; and (3) foliage at 9, 12, 14, and 17 months.

Foliage was harvested by cutting the plants at ground level with a machete. The total foliage production per plot was weighed in the field (2 central rows), and this material was later ground in a hammer mill. After the

material was carefully ground and mixed, a 500 g sample was extracted for each sub-treatment in each of the replications. The material was dried in an oven at 80 °C for 48 h to determine the total dry matter of the foliage.

Total weight, weight per plant, average root weight, total number of roots, total dry matter percentage, and weight per hectare were noted in the root harvest of the dry season trials.

Results

Dry Season Production (12 Month Cycle)

Harvest frequency had a significant effect on fresh foliage production. Frequency 1 (average yield 58.9 t/ha) and frequency 2 (average yield 55.0 t/ha) harvests were significantly different from the frequency 3 yield (39.4 t/ha). The highest yields of fresh foliage (64.6 and 63.6 t/ha) corresponded to a density of 31 250 plants/ha, with harvests at 4, 8, and 12 months, and at 8 and 12 months, respectively.

Harvest frequency also had a significant effect on the production of dry foliage. The average yield for frequency 1 was 13.7 t/ha, which was significantly different from the frequency 3 harvest of 9.7 t/ha. The yield of frequency 2 (12.0 t/ha) was not significantly different from frequency 1. The highest dry foliage yield was 14.5 t/ha, corresponding to frequency 1 at 31 250 plants/ha.

Plant density did not exert a significant effect on the production of fresh roots. The largest production (18.0 t/ha) was in frequency 3 (harvest at 12 months). This was significantly different from frequency 1 yield (8.7 t/ha). Since no significant differences were observed between frequency 2 and 3 yields, the cutting of foliage at 8 months did not significantly influence the yield of fresh roots. The highest individual yields (21.8 t/ha) were obtained at density 2 (15 625 plants/ha) with foliage harvest at 12 months.

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Harvest frequency exerted a significant effect on the production of dry roots. The yield of frequency 3 (foliage and root harvest at 12 months) was the highest (5.7 t/ha), and was significantly different from frequency 1 yield (3.1 t/ha). No difference was observed between frequency 2 and 3 yields, indicating that cutting the foliage at 8 months does not affect the dry matter production of cassava roots.

Rainy Season Harvest (12 Month Cycle)

Fresh foliage production was 86.4, 68.4, and 59.1 t/ha for densities 1, 2, and 3, respectively. Density 1 showed a highly significant difference from density 3, and a significant difference from density 2.

Density 1 dry foliage production was highly significantly greater than densities 2 and 3. There were no statistical differences between densities 2 and 3. Frequency 3 had the highest yield (foliage harvest at 9 and 12 months) (17.7 t/ha). This was significantly greater than frequency 1 (3, 6, 9, and 12 months) (14.5 t/ha).

In fresh foliage production, density 1 (31 250 plants/ha) yielded significantly more than density 2 (15 525 plants/ha) and density 3 (10 412 plants/ha). The highest yields of fresh foliage were 154.9, 165.7, and 147.7 t/ha for frequencies 1, 2, and 3 at density 1.

Density 1 (31.9 t/ha of dry foliage) yielded significantly more than densities 2 (24.2 t/ha) and 3 (22.0 t/ha).

The protein contents of the cassava foliage determined from the first harvest of the dry season were superior to those of the third

harvest, because there was a greater proportion of herbaceous material (leaves and sprigs) at 4 months than at 12 months. The protein production values of cassava foliage were highest for density 1 and for frequency 1, with values of 2.2 and 2.4 t/ha of protein, respectively.

Conclusions

By comparing the foliage production of dry and rainy season planting over a 12 month period, it is evident that for both fresh and dry matter production, planting the crop in the rainy season is better.

During the dry season, cutting frequency but not plant density exerted a significant effect on fresh foliage production. In the wet season, both density and cutting frequency influenced foliage yield.

Root production was seriously affected by cutting the foliage at 4 months. However, cutting at 8 months only reduced yield slightly because the roots had already formed and accumulated reserve material.

Excellent dry foliage and protein production can be obtained by successive cuttings at 3, 6, 9, 12, 14, and 17 months.

It would seem advantageous for foliage production in the ecological conditions found in Maracay to plant in the rainy season, with densities of between 31 250 and 15 625 plants/ha. Harvests should then be done every 75–90 days, up to 17–20 months. Production should be for foliage only, not roots and foliage. It will be necessary to develop a system to mechanically prune the foliage and thus reduce the manual labour factor.

The Effect of Various Levels of Cassava Leaf Meal in Broiler Chicken Rations

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Cassava leaf meal was used as a protein source in the rations of 1-day-old Vantress × White Rock chicks. When rations were administered in meal form, body weight gain and dietary efficiency were depressed at all levels of foliage addition up to the sixth week. This depression was noticeable during the last 4 weeks only at the top level of substitution. Pelleting greatly improved the adverse effects that appeared when the feed was given in meal form.

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