

## ***Silage of *Cratylia argentea* as a dry season feeding alternative in Costa Rica***

**P. J. Argel, M. Lobo di Palma, F. Romero,  
J. González, C. E. Lascano, P.C. Kerridge  
and F. Holmann.**

CIAT Consultant, Apartado 55-2200 Coronado, San José, Costa Rica  
E-mail: P.ARGEL@cgiar.org

---

### ***Introduction***

The legume *Cratylia argentea* (syn. *C. floribunda*, *Dioclea floribunda*), which occurs naturally south of the Amazon river through the area east of the Andes in Brazil, Perú, Bolivia and Argentina, is a shrub that branches from the base of the stem and reaches 1.5 to 3.0 m height (de Queiroz and Coradin 1995). It is well adapted to subhumid climates with a 5-6 month dry season and infertile acid soils with high aluminum content in tropical areas below 1200 masl.

Germplasm of *Cratylia* has shown good regrowth capacity after cutting and adaptation to biotic and abiotic constraints in several lowland sites in tropical America (Isla in Mexico, La Ceiba in Honduras, and several sites in Costa Rica, Colombia and Brazil) and in West Africa (CIAT 1995) CIAT and NARS have carried out studies on management and feed value of *Cratylia* in the region. Results indicate that yield of *Cratylia* fodder banks is increased when plant density is at least 20,000 plants/ha. As expected, digestibility (50–60%) and crude protein (20- 25%) vary

with plant part and maturity. Intake of fresh material is increased when *Cratylia* is cut and wilted, given that direct animal intake of freshly harvested immature *Cratylia* forage is low (Raaflaub and Lascano 1995).

The value of *Cratylia* as a cut and carry protein supplement of sugarcane or king grass fed during the dry season to lactating dairy cows is being evaluated in smallholder dual-purpose cattle farms in Costa Rica (Argel and Lascano 1998). In addition, farmers are currently evaluating the option of utilizing excess *Cratylia* forage produced in the wet season for ensiling.

In this paper we present results from the on-station and on-farm evaluation of *Cratylia* when used as silage to supplement milking cows in the dry season.

### ***Method of making silage with Cratylia***

Ensiling *Cratylia* is a farmer-based initiative and as a consequence researchers in Costa Rica are now in the process of producing information for farmers in order to allow them to make good quality silage with this legume. Farmers testing the use of *Cratylia* for silage have developed their own system of harvesting and ensiling the harvested forage. Leaf and stem material from 3-4 month regrowth is cut fresh and mechanically chopped into 2-5 cm fine pieces. Harvested material is then placed in heap-type silos and covered with plastic after good compaction is achieved. Molasses is added when ensiling pure *Cratylia* (10-15 % dry matter bases), while a silage inoculum is added in a proportion of 1 kg/ ton of silage when mixed with King grass (30:70 proportion of legume:grass silage).

## ***Use of *Cratylia* silage as a supplement for lactating cows***

In areas with 5-6 month dry season in Costa Rica, there is a need to supplement dairy cows with concentrates or chicken manure to maintain acceptable levels of milk production. However, farmers are looking for alternatives as grain imports are becoming too expensive and milk prices are decreasing. An alternative considered by farmers to reduce supplementation costs is to replace concentrates and or chicken manure by fresh or ensiled *Cratylia* fed in combination with sugarcane or king grass during the dry period.

An initial experiment was carried out in the Escuela Centroamericana de Ganaderia (ECAG), Atenas, Costa Rica (460 masl, annual mean temperature of 23.7 °C, mean precipitation of 1600 mm). Six mature Jersey cows (50 days postpartum) were randomly assigned to the following treatments arranged in a 3 x 3 crossover Latin Square design: T1=sugarcane (1.0% BW) + rice polishing (0.5% BW) + concentrate (1.48% BW) + urea (0.02% BW) ; T2=sugarcane (1.3% BW) + concentrate (0.5% BW) + freshly cut *C. argentea* (1.2% BW) ; T3=sugarcane (0.1% BW) + concentrate (0.5% BW) + silage of *C. argentea* (2.4% BW)

Each treatment period comprised 12 days of which 7 were for adaptation and 5 for measurement. Concentrate (0.5 % BW) was fed with the *Cratylia* treatments as cows used in the experiment were accustomed to receiving some concentrate during milking.

Results shown in Table 1, indicate that milk yield was similar in cows supplemented with concentrate as those supplemented with *Cratylia* fresh or ensiled. However, it was interesting to observe that milk fat was greater in cows fed *Cratylia* silage. The higher cost and lower benefit: cost ratio of feeding *Cratylia* silage were due to high labor cost in ECAG for harvesting and separating edible portions of 6-month old *Cratylia* regrowth, which is not the case in farms as indicated in a subsequent on-farm trial

**Table 1.** Dry matter intake and milk production of Jersey cows fed different diets during the dry season in Costa Rica (F. Romero and J. Gonzalez, unpublished data).

Treatments	DM intake (kg/cow)	Milk yield (kg/cow/d)	Fat (%)	Protein (%)	Solids (%)	*Cost of supplement (\$/kg DM)	Benefit /Cost Ratio
T1. Concentrate	10.8	11.1	3.5	3.4	12.4	0.20	1.33
T2. Fresh <i>Cratylia</i>	10.7	10.9	3.7	3.2	12.5	0.16	1.68
T3. Silage of <i>Cratylia</i>	10.4	10.7	3.8	3.2	12.5	0.43	0.62
Sig. Difference	Ns	Ns	P< 0.06	P< 0.01	Ns		

\* Includes the cost of all ingredients in the supplement except sugarcane

One farmer in the Central Pacific subhumid coast area of Costa Rica evaluated with the assistance of researchers the use of *Cratylia* as silage. Six crossbreeds Swiss Brown x Brahman dual-purpose cows in the third month of lactation were assigned to the following treatments arranged in a 3 x 3 cross-over Latin Square design: T1 = 12 kg sugarcane + 6 kg *C. argentea* silage + 0.6 kg rice polishing; T2=12 kg sugarcane + 6 kg *C. argentea* fed fresh + 0.6 kg rice polishing; T3=12 kg sugarcane + 3 kg chicken manure + 0.6 kg rice polishing

The results shown in Table 2 corroborate on-station results of little difference in milk yield, but higher milk fat when chicken manure was replaced by *Cratylia* silage. Results also indicate that the cost of supplementation was lower when *Cratylia* was fed fresh or ensiled, which resulted in higher economical benefit for the farmer as compared with chicken manure.

**Table 2.** Average milk yield of dual-purpose cows supplemented with *Cratylia* either fresh or as silage and with chicken manure. (M. Lobo, V. Acuña and A. López unpublished data)

Treatments	Milk yield (kg/ cow/d)	Total solids (%)	Fat (%)	Cost of supplement (\$/kg DM)	Benefit to cost ratio
T1. <i>Cratylia</i> as silage	5.1 b	12.3	3.6	0.17	1.58
T2. Fresh <i>Cratylia</i>	5.5 a	12.2	3.4	0.11	2.37
T3. Chicken manure	5.3 a b	11.7	3.0	0.22	1.14

## Conclusions

The use of *Cratylia argentea* for making silage has been a farmer led initiative in dual-purpose cattle farms in hillsides of Costa Rica. On-farm use of *Cratylia* silage as a supplement to milking cows has been shown to be a viable option for small dairy farmers given that it economically replaces expensive concentrates with no effect on milk yield. Research is underway to better define ways of producing high quality *Cratylia*-based silage.

## References

- Argel, P.J. and Lascano, C. E. 1998. *Cratylia argentea* (Desvaux) O. Kuntze: Una nueva leguminosa arbustiva para suelos ácidos en zonas subhúmedas tropicales. *Pasturas Tropicales* **20**, 37-43.
- CIAT. 1995. West and Central African animal feed research project "Adaptation of Forages in West Africa". Working Document No.145. CIAT, Cali, Colombia.

***Poster: Silage of Cratylia argentea as a dry season feeding alternative in Costa Rica***

---

de Queiroz, L.P. and Coradin, L. 1955. Biogeografía de *Cratylia* e Areas Prioritárias para Coleta. In: E.A. Pizarro and L. Coradin (eds.). Potencial de Género *Cratylia* como Leguminosa Forrajera. Memorias del taller de Trabajo sobre *Cratylia* realizado el 19 y 20 de julio de 1995, Brasilia, DF, Brazil. Working Document No. 158. CIAT, Cali, Colombia. pp. 1-28.

Raaflaub, M. and Lascano C. E. 1995. The effect of wilting and drying on intake and acceptability by sheep of the shrub legume *Cratylia argentea*. *Tropical Grasslands* **29**, 97-101.