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# RAT CONTROL IN COCONUT PALMS IN COLOMBIA

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**ABSTRACT:** The black rat (*Rattus rattus*) causes severe damage to coconut (*Cocos nucifera*) crops in Colombia. These rodents climb to the crown of producing palms and often nest there. Damage results from the rats gnawing the shells of the coconuts until they penetrate to the endosperm; the perforated nuts will fall within a period of 15 days and are unsuitable for harvest.

Since 1972, the Colombian Agricultural Research Institute (Instituto Colombiano Agropecuario or ICA), through its Vertebrate Control Program, has been conducting a series of investigations to obtain information about the characteristics of this damage and the best means of reducing it. Damage surveys in several of the principal coconut-producing areas reveal a high percentage of crop loss (e.g., Tumaco - 20%, San Andres Island - 34%, and Gorgona Island - 60%) and illustrate the seriousness of the problem. The lack of water (i.e., rainfall) during the dry season seems to be associated with increased damage.

In some areas, such as San Andres, the planting density is excessively high. Hence, physical barriers such as metal bands on the trunk are ineffective -- the proximity of the palms allows the rats to transit easily among adjacent trees on overlapping fronds. Our observations indicate that chemical control using anticoagulant baits placed in the palm crowns, significantly reduces damage. The effect of a single baiting can last up to six months, with the length of the effect dependent upon cultural practices implemented after treatment (e.g., maintaining cleanliness of area, weed control, etc.). At present, chemical control and associated cultural practices is the program recommended by ICA for reduction of rat damage to coconut crops in Colombia.

## INTRODUCTION

Surely, the diversity of climates and microclimates has been one of the most important factors for Colombia to possess an abundant and diversified fauna at the present time. Mammals represent a heterogeneous group among which rodents stand out. These vertebrates are considered an important pest from the social as well as the economic points of view. The increase of some rodent populations has been, in many cases, a limiting factor for introduction or development of some crops. Doubtless, coconut (*Cocos nucifera*) is the crop most commonly affected by rodents in Colombia. The rat damage is prevalent in the major part of the coconut-producing areas of this country. Worth mentioning is that Colombia possesses 13,795 ha planted to coconut (Vallejo 1979).

In zones such as San Andrés Island and Tumaco, farmers derive their earnings from a crop of coconut (Valencia et al. 1975). In the Gorgona Prison Island, apart from being consumed, coconut also provides the basic raw materials for the handicraft industry of the prisoners. The coconut-producing areas of Colombia most affected by rodents are located in the following zones: Pacific Coast, Atlantic Coast and several Territorial Islands (Sánchez and Mena 1972) (Figure 1).

The rat damage consists on gnawing the husk to reach the soft shell or inner shell. Approximately a week after penetration of the husk, the nut falls prematurely, unsuitable for commercial purposes (Elias et al. 1971, Elias and Valencia 1973). Strecker (1962) points out that rats feed on coconut water. Rodents use the crown of the palm for feeding and also for nesting. The traditional systems of control practiced in the affected areas of Colombia have been confined to the occasional use of poison baits distributed throughout the whole plantation. Some farmers have decided to protect the palms by placing metallic bands around the trunk.

Although these systems aid to partly diminish the damage, they do not achieve an optimum control, neither a prolonged effect to increase yield. With the exception of the investigations carried out by the Colombian Agricultural Research Institute (ICA), there have been no surveys that analyze rodent problems on rural or agricultural areas, and especially on the coconut crop. The ICA Vertebrate Damage Control Program has been conducting a series of investigations tending to recognize damage characteristics, biology of the damage-causing species and specifically, methods of control in the affected zones. This paper emphasizes the work on the control of the black rat in coconut palms in Colombia.

## MATERIALS AND METHODS

Before beginning a control program, a series of evaluations on the terrain to determine and quantify the damage was considered a necessity. Without this information, it is almost impossible to assess the economic losses caused by rats, or measure the reliability of a Control Program (Williams 1971). With this objective, the evaluation techniques developed by the "Coconut Industry Board of Jamaica" were followed. The rat damage evaluations were carried out before and after the respective treatments, in order to determine their effect and duration. Generally, the damage evaluations consisted of selecting at random a 100-palm sample (plot), the sample palms were marked for identification, and the rat-damaged nuts present were removed so that the plot was free of them. A week after selecting, marking and cleaning the field, the damaged nuts which had accumulated were counted and jotted down. These nuts were then removed leaving the plot clean again.

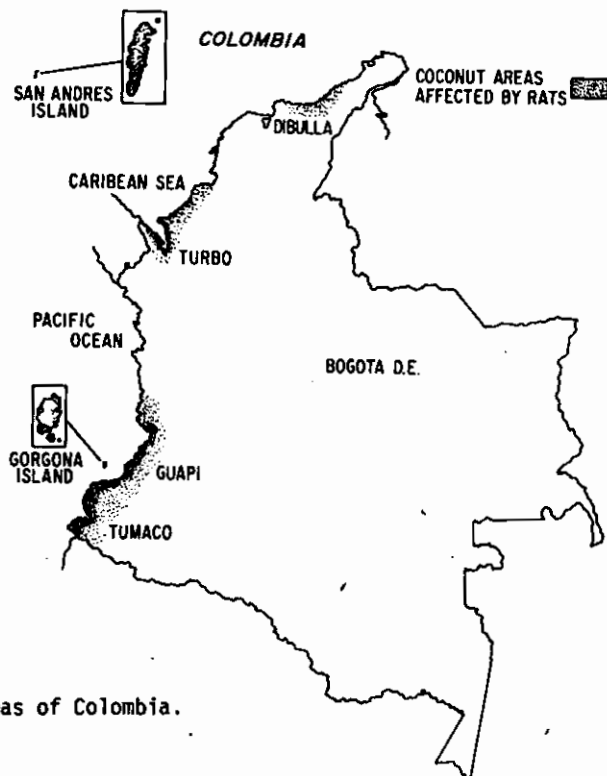


Fig. 1. Coconut areas of Colombia.

This process was performed for three consecutive weeks. The total number of damaged nuts during this period was multiplied by 17/100 to obtain an average of the nuts damaged per palm per year. This figure was divided by the mean production per palm per year. An average of 50 nuts was taken, although this quantity varies on zones like San Andres Island, where there is an approximate mean of 30 nuts per palm per year (Vallejo 1979). As an example of the above-mentioned process, we shall consider that if a total of 120 damaged nuts is recorded on a 100-palm plot, the percentage of damage is obtained as follows:

$$\frac{120 \times 17}{100} = 20.40 \text{ nuts per palm per year}$$

$$\frac{20.40}{50} = 0.41 \text{ that is to say 41\% of damage}$$

The constant 17 is calculated by dividing the 52 weeks of the year by the 3 weeks of the observations. Based on the previous technique, evaluations were carried out on the main coconut-producing affected areas such as San Andres Island, Gorgona (Prison Island), Tumaco (Nariño) and Dibuilla (Guajira). Research works intended to determine the most effective system or systems to control the damage in the influenced areas were accomplished in 1975 as based on the results of the evaluations conducted. Trials were fulfilled arranging rodenticides on the base (ground), trunk and the crown of the palms, and places accessible to rodents. Rodenticides utilized were RH-787 (pyriminil), RACUMIN (coumarin), and RAMIK (diphacinone), packed in plastic bags weighing 20, 50 and 75 grams, respectively.

To identify the damage-causing species, periodic trapping was established utilizing live-traps and snap-traps and then taking the captured animals to the Natural History Museum in Cali for identification.

It is very important to mention that in addition to field work for rat control, surveys were also accomplished on the agronomic conditions of the crop, its pests (insects and diseases), as well as a tremendous educational campaign among inhabitants of the coconut-producing zones.

## RESULTS AND DISCUSSION

### San Andres Island

The initial observations in the Island of San Andres based on one single sample indicated a high percentage of damage (77%) (Elias et al. 1975), which justified the initiation of studies that led to what is presently known as "Campaign to control rats in the coconut palm in San Andres Island". These evaluations also indicated that in the Island of San Andres, the damage varies by the altitude and by zones; for example, lots with up to 67% were encountered in areas at sea level and lots with 24% in the upper part of the Island (at approximately 60 m above sea level).

The identification work determined that the black rat (*Rattus rattus*) is the damage-causing species in San Andres, Tumaco, Gorgona and the Atlantic Coast. Arranging baits in the axis of the leaves showed the most effective results to control rats in the coconut palm. Also proved was that placing poisons on the ground represents a serious danger for children and pets, since the product remains easy to be reached by them.

The recommended planting distance for the "tipica" variety is 9.00 m between palms (Sanchez and Mena 1972). In the Island of San Andres, however, this distance is 5.9 m which reflects in competition for light, soil nutrients, and water (Freeman et al. 1976).

As a result of the high-planting density, the physical method of rat control using metal bands around the trunk is not so effective, as in many parts of the Island rodents can pass from one palm to another across the leaves. Garbage and harvest residues benefit the increase of rodent populations in the Island. The ICA advertizing campaigns have been emphasizing the elimination of these and other rat reproduction sites as a cultural control measure to diminish these populations.

On the other hand, it was observed that the damage increases during the dry periods when water sources are scarce and presumably rodents must consume the liquid produced by the coconut.

Data clearly indicate that treatments with any of the three products utilized (pyriminil, coumarin and diphacinone), when applied in the crown of the palm, significantly reduce the damage caused by rats for a 4-5 month period.

Figure 2 shows the effects of the three rodenticides tested in San Andres. The three products exhibited a statistical significance in damage reduction. Due to economic reasons and its effectiveness, it was decided to use coumarin for the actual campaign of rodent control in coconut palm in the Island of San Andres.

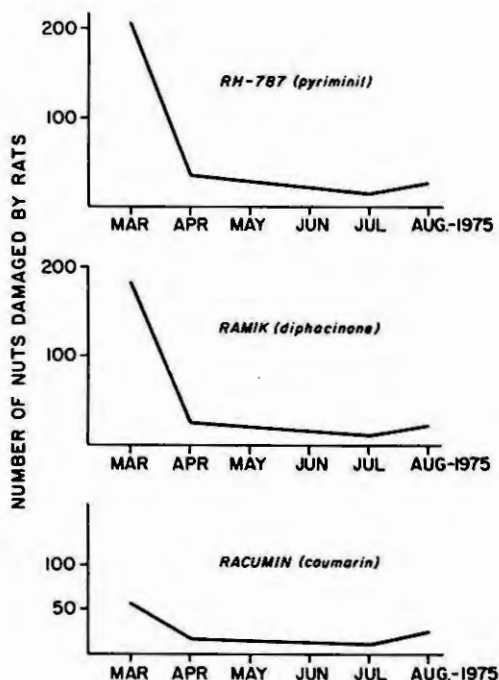


Fig. 2. Effect of 3 rodenticides to control the rat damage in coconuts in San Andres (Colombia).

The objective of this campaign, initiated in November, 1978, was to perform a mass treatment in the affected areas until it covered the whole Island. It is expected that treatment following this campaign would be performed by farmers only in those palms showing damage, to keep a low rodent population.

#### Gorgona and Tumaco

Due to its volcanic origin the Gorgona Prison Island presents different ecological conditions from those of San Andres. However, its problem with the black rat equals San Andres. The coconut-producing area in Gorgona is located in 6 lots with about 2,000 palms each distributed throughout the Island. The rest of the area shows another type of vegetation, free of rat damage.

Previous observations in 1978 indicated 60% rat damage in coconut palms, which is an index of the severe problem existing before treatments began. For natural reasons the high-planting density does not allow an effective physical control based on metallic bands around the palm trunk.

The treatment with diphacinone performed in 1978 and 1979 reduced the damage from 60% to 1%. This reduction has been reflected in the increase of nut production.

In the Pacific Coast and specifically in Tumaco, the initial observations (1978) showed 20% rat damage which was considerably reduced (0%) by the month following the diphacinone treatment.

For several reasons, it was impossible to determine the rodenticide effectiveness period in Tumaco and Gorgona, but it is presumed that control lasted up to 4 months, according to information supplied by farmers. Climbing the palm to place the bait in the crown has been a limiting factor for the success of the treatment, especially in Gorgona and Tumaco, where there are few persons capable of climbing the palms. This constraint makes the treatment per palm more expensive.

### Dibulla

The damage caused by rats in the coconut-producing area near Santa Marta (Dibulla) is provided as a matter of interest. Four percent was the estimated damage and this was located in a small area. Cultural control through eliminating garbage and eradicating weeds is considered the most effective and economic control measure for this zone.

### CONCLUSIONS

1. The damage caused by the black rat (Rattus rattus) in the coconut-producing areas of Colombia limits nut production.
2. High-planting density prevents the physical control from achieving an acceptable effectiveness.
3. Bait-based rodenticide treatments applied directly in the crown of the affected palms, control the black rat damage for up to 5 months.
4. Cultural practices (cleaning and removing garbage) integrated with the rodenticide-based control may offer a prolonged and effective system to regulate rats in the coconut palm in Colombia.

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