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SURVIVAL AND GROWTH OF BARU (*Dipterix alata* Vog.) TREATED WITH SEWAGE SLUDGE, COMPOSTED GARBAGE OR CATTLE MANURE ON MINED SPOILS IN THE BRAZILIAN CERRADO

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Sewage sludge and composted garbage are available in large quantities to be employed as sources of organic matter for revegetation projects of mined spoils in the Brazilian Federal District (DF). These sources were used for growing baru (*Dipterix alata* Vog.) on mined spoils in the Brazilian Cerrado and the growth and mortality of 99 seedlings treated with these organic matter soruces were measured. In 4 months, rates of survival ranged from 56.7%, for trees treated with compost, to 96.7% for plants treated with sewage sludge. The compost seems to have toxic effects on seedlings, since the treatments with 35, 45 and 50 L/hollow had no survivals. After the first period of growth, the study was able to show that the best rate for plant development with sewage sludge was 20 and 30 L/hollow (57% and 47). For plants treated with compost, the best result was obtained with the smallest dosage (5L/hollow), where the growth is similar to the best results obtained with the sludge (47%). In larger doses the growth varied between 6% and 24%, span in which the results obtained in the control treatments, chemical treatment (16%) and no treatment (12%) are also found. Therefore, the increase in growth of the seedlings is a function of the dosage and type of organic material employed.

INTRODUCTION

The impacts of the destruction of natural environment by humans have been drawing the attention of the general community and the greatest challenge is to keep the actual levels of biodiversity (Wilson, 1994; Young, 2000).

Mining activities have brought drastic consequences to Cerrado as deforestation and excavation take place everywhere. Severe absence of organic matter and the consequential low capacity of retaining water have made precarious the natural re-growth of the vegetation on mined spoils. Pereira (1990) stresses the Cerrado´s incapacity to recompose the original vegetation in mined areas, even after some decades of natural succession. Nevertheless, Silva *et. al* (2003) showed that human´s intervention can accelerate the re-growth process, allowing succession to take place and causing great increase of the vegetation coverage and diversity.

The necessity to intervene in mined areas resulted in the development of new techniques for the treatment of the spoil exposed and the selection of the species which are able to grow and to develop themselves under the arid conditions of extremely degraded places. Regarding the organic matter layer, it has shown to be a determinant aspect, given that it influences various physical, chemical and biological factors of the soil, carrying out different functions. It works as a granulator of mineral particles and is capable of structuring mining spoil. The organic matter can still give macro and micro nutrients and it is important for the increase of the water retaining capacity in soils and spoils (Dedecek, 1993; Primavesi, 1981).

Under suc perspective, the sewage sludge and the compost are available and economically advantageous sources of organic material for projects for revegetation of mined areas in the Federal District (DF). Recycling these composts showed to be an ideal alternative, because it solves the disposing problems and recompose nutrients and organic matter where necessary. According to the Brazilian Agenda 21 (MMA/PNUD, 2002), an environmental management of residues is one of the most important dues for us to keep the quality of the environment.

Baru (*Dipterix alata* Vog.) is a vastly distributed species in Cerrado (Ribeiro *et. al*, 1996; Salomão, 2003). Its uses include, feeding, medicinal, logging and landscape painting (Almeida *et. al*.,1998). According to Oliveira (1996), this species has a great potential to attract fauna and is recommended to recompose degraded areas.

The purpose of this project is to evaluate baru´s development and survival after being treated with sewage sludge and composted garbage.

MATERIAL AND METHODS

The experiment was conducted in a gravel mine in the ARIE Santuário de Vida Silvestre do Riacho Fundo-DF, Brazil, between January and April 2004. Ninety nine pits of 64 L were excavated at a distance of 4m x 4m. Increased rates of organic matter were applied in triplicate to hollows, corresponding to 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50 liters, resulting in 30 hollows for each organic matter source plus nine controls. Chemical fertilization only, manure only and non-fertilized hollows were used three different controls The chemically fertilized plants received 100g of NPK 4:14:8 and 100g of limestone each.

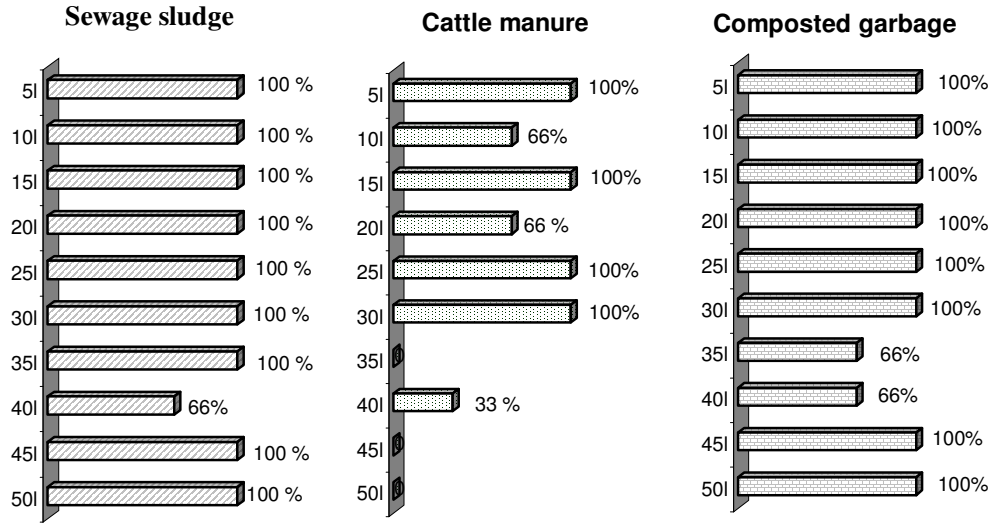
Seedlings were planted 15 days after fertilization on 6th of January 2004. Plants were tagged and their heights were taken on the spot and four months later at the end of rainy season. Values for growth were given in percentages related to the height on the date the seedlings were planted. Dead plants were counted and from this value, it was estimated the rate of survival for each treatment. Dead, attacked or damaged seedlings were not replaced.

Data have not shown homogeneity and the standard deviations for averages were excessively high. So it was not possible to use the parameters tests to compare the averages. The data was chosen to be presented by using the median of the values observed.

RESULTS AND DISCUSSION

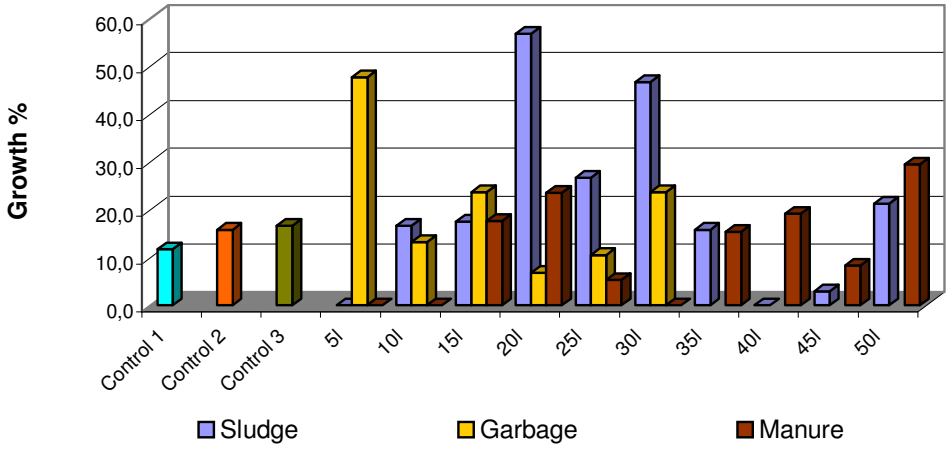
Survival rates varied from 56.7%, for the seedlings fertilized with compost to 96.7, for the ones fertilized with sewage sludge. For the treatments with sludge, the rate of 40L showed 66% of survival. The others presented 100%. The seedlings fertilized with manure had a total of 93.3% of survival. The survival rate was inferior 100% only for the dosages 35 and 40L. The compost treatment presented a very low rate of survival, having in mind that the rates of survival of the controls (no fertilization, only chemical and only manure) were 100%. According to Figure 1, starting form the dose 35L of compost, there was a generalized death of the seedlings and the survival rate is zero for the 35, 45 and 50L treatments. This can be related to some kind of toxic effect caused by the high concentrations of the garbage compost on the baru seedlings.

Figure1- Survival percentage of baru (*Dipteryx alata*) seedlings submitted to increasing doses of 3 different sources of organic matter.



The highest rates of growth found for the seedlings were 56% for the 20L of sludge, 47% for the 5L of compost and 29% for the 50L of cattle manure treatment. However, with 20L of cattle manure, a similar growth rate (23%) was found which indicates it would not be worth to use a higher dose (Figure 2).

Figure 2- Percentage of growth for baru (*Dipteryx alata*) seedlings treated with increased rates of three different sources of organic matter and control treatments.



Control 1- no fertilization; control 2- Chemical fertilization only; control 3- fertilization with 30 liters of cattle dung.

Fertilization with sewage sludge presented the best results for survival and growth among all treatments. According to Correa & Melo Filho (2000), the sludge can be twice more efficient than the composted garbage in terms of positive interaction with Cerrado´s species in degraded areas. However, it was not found significant differences in the survival of baru when fertilized with sewer sludge and garbage compost.

Figures 1 and 2 show that the growth for seedlings at 5L of compost is similar to the growth at 20L of sludge. At higher doses of compost, growth rate varied between 6 and 24%. It is possible that compost is more interesting than sewage sludge, due to presenting similar results with lower rates. Nevertheless, the toxic potential of composted garbage needs a peer investigation..

CONCLUSION

- Baru presented the highest survival and growth rates when treated with sewage sludge.
- The lowest rate of composted garbage resulted in a similar growth of plants treated with sewage sludge.
- Increased rates of composted garbage resulted in decreased survival rates of baru trees
- The survival rates obtained with manure were similar to the ones achieved with sewage sludge although, the rate of growth was lower than the one achieved with sewage sludge.

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