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Tithonia diversifolia impact used as bio-fertilizer on maize (*Zea mays*) in the region Mbujimayi, Kasai oriental province, DRC

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Abstract

The use of *Tithonia diversifolia* as organic fertilizer, plant species that have good content basic mineral elements including nitrogen, improves the efficiency of maize in the region Mbujimayi tropical savannah. Soils in this tropical region, are characterized by the weakness of the nitrogen and phosphorus content. A test was conducted on the site of the Official University Mbujimayi by testing a few doses of *Tithonia diversifolia* on corn. The following results were obtained: -The yield of 2.5 tonnes of maize (Var Mus) is obtained with the control without fertilizer. -The Return of 4.8 tonnes of maize was recorded with 3 tons of dry matter *Tithonia diversifolia*. This plant species is a good organic fertilizer on maize in Mbujimayi region in the southern part of the DRC in Sub-Tropical.

Keywords: Impact, *Tithonia diversifolia* bio-fertilizer, crop, corn, Mbujimayi, DRC

1. Introduction

Organic manure well clear today in good measure as a solution to the problem of soil fertility in the tropics. Although it takes up limited availability constraint of these bio-fertilizers (Singh, 1988).

It is our responsibility also to determine among plant species, those that are best suited as organic fertilizer for our region. This study is under review in this perspective.

The state of soil fertility characterized by weakness of the nitrogen and phosphorus content in the tropical savannah regions, remains a major constraint to agricultural production in general and especially for that of cereals (INERA, 2001; Sanchez et al 1977; and Edmeades Laffitte, 1996). Yet these are the basic food in much of the tropics, including that of Mbujimayi; with the production of corn still insufficient forcing the Kasai Oriental Province on imports of this product (Anonymous, 2008; FAO, 1998)

The *Tithonia diversifolia* is a plant whose leaves can well be used as organic fertilizer with good content based minerals including nitrogen (Palm et al, 2001; Ikerra et al, 2007; Nziguheba et al, 2000; and Buresh Niang, 1997. Jama et al, 2000) .The use of this plant species as organic manure on the cultivation of maize in the region Mbujimayi improve the production of maize, the staple food in this part of the Democratic Republic of Congo.

A test was conducted on the site of the Official University of Mbujimayi by testing a few doses of *Tithonia diversifolia* to determine which causes a good yield of maize in the region Mbujimayi.

2. Materials and Methods

2.1. Physical Framework

It is the site of the Official Mbujimayi University located in the city of Mbujimayi, Kasai Oriental Province in DR. Congo, which provided the framework for the realization of this test. The City of Mbujimayi is located in the intertropical convergence area is that of low pressure, located 666 km of Ecuador, it extends between 6 ° 5 'and 6 ° 10 south latitude and 23 ° 27' East longitude. The City of Mbujimayi is located on the plateau 500-1000 m altitude. It rains a lot in the Mbujimayi Region, the volume of rain is around 1500 mm with an eight-month rainy season is from January to April and September to December. The dry season

lasts four months, from May to August Day and night temperatures are close to 30 ° C, respectively, with an average of 25 ° C. The floor Mbujimayi Area consists of 80% sand and from 7 to 15% clay. This sandy soil with a loose structure, its thickness is at least 1 m, which makes a favorable ground for infiltration with:

The medium pH is about 6.7.

The average nitrogen content of the soil is of the order of 178 kg / ha small compared to the needs the maize crop that is of the order of 240 kg / ha.

The average phosphorus content is 25 kg / ha small compared to the needs of culture but of 90 kg / ha.

The potassium content is average 85.5 kg low compared to need the same culture that is 270 kg / ha.

Vegetation on the hinterlands or in the city of Mbujimayi consists of fruit trees, ornamentals, lawns and various herbs. The relief dominating the city of Mbujimayi is the plateau, but it becomes rough here and there because of the ravines due to lack of drainage canals and poor drainage of waters.

2.2. Equipment

2.2.1. Biological material

These are the Mus seed variety (Anonymous, 2008) and the organic fertilizer (Tithonia diversifolia leaves) that formed the biological material for this test.

2.2.2. Technical Equipment

It was composed of: hoe, rake; tape measure, calipers, balance and the field diary. Small equipment was used to work opening, installation and maintenance of the experimental field. It was also used to perform various actions such as test data.

2.3 Methods

2.3.1 Experimental

The experimental design of randomized complete block is one that has been used. He had four blocks and four treatments. Each block consisted of four plots of 3mx2m spaced 0.50m. The blocks were separated from 1m, the total area of the experimental field is (17 x 11.5) m or 195.5 m² with either the useful area of 96m².

The following treatments were compared.

To: fertilizer without witnesses

T1: the dose of 1 tonne of dry matter per hectare Tithonia diversifolia

T2: a dose of 2 tons / ha of dry matter Tithonia diversifolia

T3: a dose of 3 tons / ha of dry matter Tithonia diversifolia

3.3.2. Technical testing route

1) Preparation of the land

She won several actions: clearing, followed by the demarcation of the land, plowing with the hoe to a depth of roughly 25 cm. Harrowing was with the rake to loosen the soil.

2) Fertilizer Tithonia diversifolia leaves

Burial of the fertilizer was made on 10/09/2009 as basal dressing.

3) Sowing

Corn planting was done ten days after application Tithonia diversifolia 0,75mx0,50m with the spacing of three seeds per hill.

4) empty Reline

One week after sowing, was taken to empty relining bringing it to 100% emergence rate.

5) thinning and weeding

Both operations were carried out two weeks after planting and the second was performed a second time in a month and a half of the harvest

6) Harvest

It is at 100 days from sowing we proceeded to harvest. Some cobs were dried to the sun, for the 1000 kernel weight.

2.3.3. Variable observed

To determine the effect of doses of Tithonia diversifolia on the development and yield of maize cultivation:

- It was action on vegetative parameters below: Raising rate, plant height, leaf length, collar diameter.
- It was also action on following production parameters: Number of plants per plot, number of ears per plant, number of rows per ear, number of kernels per row. 1000 kernel weight and grain maize production per plot and yield of grain corn in tons / ha.

3. Results and Discussion

3.1. Vegetative parameters

The results of different vegetative parameters are shown in Table 1.

Table 1: Results of different vegetative parameters

Parameters Treatment	Emergence rate	Plant height cm	Leaf length cm	Cm diameters Culture
Témoïn	79,6 b	216, 30 a	91,00 b	1,81 b
1 t/ha MS	84,9 b	223,90 a	99,50 a	1,92 b
2 t/ha MS	82,8 b	224,10 a	99,20 a	1,95 b
3t /ha MS	90,9 a	224,10 a	102,90 a	2,15 a
LSD 0,05	6,69	13, 68	5,83	0,21
CV %	3,5	2,7	2, 6	4,8

Averages with the same letter in the column are not significantly different at the 5% probability.

This Table 1 shows that treatment of 3t / ha MS Tithonia diversifolia recorded high values compared to the other three treatments.

3.2. The parameters related to production

The results of various parameters related to production are in Table 2.

Table 2: Results of various parameters related to production

Parameters Treatment	Number of plant / Plot	Number of spike per plant	Number of row per ear	Number of grain per row	By weight of 1000 grains	Production corn grain Kg / Plot	Corn grain yield t / ha
Témoïn	41 a	1,08 b	12,40 a	30,70 a	333,75b	1,53 c	2,55 c
1tha M.S	40,25 a	1,15 b	12,90 a	31,50 a	338,75b	1,86 b	3,08 b
2t/ha M.S	41,20 a	1,50 a	12,60 a	34,20 a	343,75b	2,16 a	3,60 b
3T/ha M.S	41,75 a	1, 58 a	13,4 a	33,40 a	356, 24a	2,90 a	4,84 a
LDS 0,05	1,31	0,31	1,35	4,63 a	10,24	0,33	0,56
CV%	1,41	10,5	4,7	6,3 a	1,3	7,1	7,1

Means followed by the same letter in the columns do not differ significantly at the 5% probability according to the LSD test.

This table shows that the treatment of 3t / ha MS *Tithonia diversifolia* gave higher values compared to the other three treatments to production parameters with the exception of kernels per row for which the processing 2t / ha MS *Tithonia diversifolia* gave a higher value than the other treatments.

3.3. Results interpretation

For vegetative parameters, analysis of variance shows that the difference is significant between treatments for emergence rate, the length of sheet, the diameter of the collar. The dose of 3t / ha MS *Tithonia diversifolia* gives higher values than the other treatments. Regarding the height of plants, variance analysis indicates that there is no significant difference between treatments.

For the parameters associated with the production, the analysis of variance indicates that there is no significant difference in terms of following variables:

The average number of plants per plot,

- Average number of rows per ear,

- Average number of kernels per row,

By cons, there is a significant difference in the following parameters:

- The average number of ears per plant, average 1000 kernel weight,

- Production in kg per plot

- Corn grain yield / ha

The dose of 3t / ha gives higher values compared to other treatments.

3.4. Discussion

The dose of 3 tons / ha of manure *Tithonia diversifolia* gives higher values compared to the other for all vegetative parameters except the height of corn plants. It would be an optimal dose that releases the nutrients in quantities that promotes good growth of maize (Mus variety). The plant height is an intrinsic characteristic of the variety that is not influenced by the dose of fertilizer given to culture.

Similarly for the parameters related to the following production:

- Average number of rows per ear, average number of kernels per row are also intrinsic characteristic of the variety that would not be influenced by the dose of fertilizer given to culture. While the average weight of 1000 seeds, grain corn production fragmented and corn grain yield in tons / ha are parameters that translate the influence of the dose of fertilizer, which would explain the results recorded with dose 3 tons / ha of *Tithonia diversifolia*.

4. Conclusion

This work is entitled "Impact of *Tithonia diversifolia* used as bio-fertilizer on maize (*Zea mays*) in the Mbujimayi Region (Kasai Oriental Province DR Congo.).

It was aimed to determine the dose of organic fertilizer with *Tithonia diversifolia* which gives a good yield of corn in the Mbujimayi region.

The *Tithonia diversifolia* which has already proven itself as a bio-fertilizer on some crops in some areas, increase the development and yield of maize in our region Mbujimayi.

The device randomized complete block was used as a method of experimentation in the field for this study.

After this test, the following results were recorded:

- Dose 1 t / ha of DM of *Tithonia diversifolia* gives redement maize grain of 3,08 t / ha.

- The dose of 2 tonnes / ha DM *Tithonia diversifolia* gives grain corn yield of 3.60 tonnes / ha.

- With a dose of 3 t / ha of DM of *Tithonia diversifolia*, there were yield of 4, 84 t / ha of maize (Mus variety) as well, it can be seen clearly; dose of 3 t / ha of DM of *Tithonia diversifolia* per hectare gives a good yield of corn grain. This dose may be recommended to corn producers in the region for this Mbujimayi organic manure.

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