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Fertilization effect based solid fertilizer "DERMAZOTO N_{11}" on a driving under pepper cultivation in greenhouse drip irrigation

Kebour Djamila*, Boutekrabt Ammar

Department of Biotechnology, Faculty of Natural Science and Life, University of Blida 1 Algéria

Email address
djakeb@hotmail.com (K. Djamila)

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Abstract
The coastal of Algiers is characterized by good climatic conditions for the market cultures that it is in full fields or under greenhouse. Nevertheless, a sandy soil poor in terms of mineral elements and in organic matter, what returns the recourse to the obligatory fertilization. Fertilization has for essential goal to maintain the fertility of soil to satisfy the needs of the cultures, and to have a good production of the point of view output and quality. The organic manures are considered like complete manures that contribute to the fertility of soils. Among them one mention like example manure of bovine and the droppings of poultries but there are also the organic garbage of the industries. Our work consists in fertilizing a conducted bell pepper culture under greenhouse in irrigation drips to drop with organic manure the DERMAZOTO N_{11} and to compare it to organic manure of farm, considered like witness in order to determine his/her/its effect on the output and the quality.

1. Introduction

Algeria is a country where the climatic conditions favor the market garden production. It has great potential for vegetable production. The most appreciated by the Algerian population vegetables: potatoes, tomatoes, peas, peppers.

Vegetables, by their wealth of vitamins, minerals and proteins, provide the man a balanced diet. They are divided into leaves, vegetables, seeds, root vegetables (tubers) and fruiting vegetables. Among these, we find the pepper (*Capsicum annuum*), which is essentially rich in vitamin C. World production for 2005 is estimated at 25.02 million tonnes and China, the largest producer in produces nearly 50% of world production 046.8 and 191 tonnes for Algeria [1].

Increase production by increasing acreage is possible that a marginally. It is therefore necessary to achieve the objective to increase yields by introducing improved agricultural techniques. One of the issues that must hold our attention is the use of fertilizers. Fertilization is a major component of crop production, and the effect of fertilizer on increasing crop yields is sufficiently known throughout the world [2] .

In this context, we realized that our experiment is a test of a solid fertilizer waste hides and skins which manure is applied in a background, namely "DERMAZOTO N $_{11}$", newly introduced in Algeria on a culture of pepper (variety Lipari) and that in order to determine the effect of the fertilizers on quality and yield.

It is an organic nitrogen fertilizer based on hides and skins hydrolyzed.

It is obtained by the hydrolysis of collagen sclero protein high pressure.

It contains chelates of Fe and Mg in the organic matrix, the active living biomass and improves the humus balance [3].

Mineralization of organic N is determined by the type of soil (weaving), structure, moisture, oxygen, temperature. It is between 2 to 4 months. This is an excellent product as basal dressing, autumnal and spring; in paddy field or cover in orchards and in vineyards with or without weed, to prevent and treat iron chlorosis and magnesium deficiency [4].

2. Material and Methods

2.1. Presentation of the Work Site

Our study was conducted in northern Algeria, specifically the coastal region of Algiers (Staoueli). whitch is located North-West of Algiers center and is bounded by Cheraga North-West, South is the town of Souidania and South-West by the municipality of Zéralda.

2.2. Objective

It is a test based fertilization solid fertilizer "DERMAZOTO N_{11}" on greenhouse pepper cultivation in drip irrigation, where we used two treatments will be compared. These are treatments that will be compared. These are:

-T_1: with "DERMAZOTO N_{11}"

- T_2: without "DERMAZOTO N_{11}"

Whose purpose is to determine the effect of fertilizers on quality and yield of the crop of pepper.

2.3. Plant Material

The species taken in the test is pepper (*Capsicum Annum* L), the chosen variety is a hybrid F1 "Lipari".

The choice of this variety was based in part on the availability of plants suitable for transplantation, and the other hand on its varietal characteristics. It is a vigorous, productive, early, pointy fruit sweetness, resistant to TMV virus (tobacco mosaic) and well suited all cropping patterns.

2.4. Experimental Conditions

The experiment began on 11. 12. CASSDEP 2012 in a greenhouse covered with a polyethylene plastic film metal structure, requires 500 m^2 of the film needed to cover the greenhouse.

The greenhouse is 50 m long, 8 m wide and 3.5 m high, with an area of 400 m^2, is oriented north-south direction, ventilation is ensured through the side windows and the two gates of the greenhouse. The latter is equipped with a system of irrigation drip which is connected to a metering pump which operates fertigation culture.

2.5. Device Experimental

The experimental setup is an experimental design without control heterogeneity factor 1 studied with repetition device completely randomized.

At this level there are two treatments that will be compared each treatment contains 3 lines, it is:

1) T_1: Mineral-Fertilizer background at 100 kg / ha of 15-15-15.

- Solid fertilizers "DERMAZOTO N_{11}" at a rate of 4 kg / online. The fertilizer will be buried at the time of transplanting.

2) T_2: Mineral-Fertilizer background at 100 kg / ha of 15-15-15.

Organic Fertilizer-bottom at 60 tonnes / ha of well-rotted manure.

2.6. Conduct of the Trial

2.6.1. Establishment of Nursery

The nursery was established October 28, 2012 in pots. The amount of seed used was 2 seeds per pot for 50% and 50% of seed for other pots. The bed was composed of a mixture of peat and marc. The mixture was well impregnated with Dithane M 45 because of a spoon to 4 liters of water to fight preventively against fungal diseases.

2.6.2. Conduite Nursery

Driving nursery was characterized by:

- A watering every four (4) days to conserve soil moisture.

- An operation weeding performed every fifteen (15) days during the period of stay seedling nursery regularly.

However, no application of mineral fertilizers and pesticides has been carried out during the stay of the seedlings in the nursery, that is to say, during the period from sowing to transplanting.

2.6.3. Soil Preparation

To achieve the objective assigned to work the ground, it is necessary to use several operations, all while preserving the soil structural stability. In short the tillage plowing was done using a tractor equipped with mechanical plows, which return the earth to a depth of 30-50 cm and destroy weeds aims. Followed by disking, a week before transplantation to pulverize the clods created by plowing and leveling for a smooth and crumble the ground. Plants were spaced 1 m between rows and 0.40 m on the plants.

2.6.3.1. Transplantation

Transplantation was performed 45 days after the establishment of the nursery, October, 2012. Seedlings were transplanted at a distance of 0.40 m on the rows and 1m between rows. Each treatment consists of three (3) lines and each line contains 115 seedlings.

2.6.3.2. Fertilization

To improve soil fertility, we used a mineral fertilization maintenance based soluble fertilizer. These fertilizers contain two major components, it is Nitrogen and Potassium. The dose of these two elements differs depending on the phenological stage. Fertilization is done once every 10 days. The table below summarizes the amount of fertilizer at each

stage.

Table 1.1. *Determination of fertilizer based on phenological stages.*

Phenological stage	Initial	Flowering	Fruit set	Fruit set mid-magnification
fertilizer	3 kg of Nitrogen fertilizer + 2kg of Potassium	3 kg of Nitrogen + 2 kg de of Potassium	2 kg Nitrogen + 3kg of Potassium	2 kg Nitrogen + 3kg of Potassium

2.6.3.3. Irrigation

Given the nature of the soil, climatic conditions of the area, the type of crop and type of rooting (30-60 cm). For irrigation of the greenhouse, we used the localized irrigation method which is to use the drip system for the direct application of water to the plant. This type of irrigation allows a considerable saving in water. The distribution of water is as remote

- Between ramps: 1 m.
- Between tasters: 0.40 m

2.7. The Parameters Studied

To make a comparison between the two treatments, we conducted observations mainly related to the parameters of earliness, yield and quality.

2.7.1. Growth Parameters

2.7.1.1. Precocity

To get an idea of the impact of treatment on early, we were asked to note the dates:

- Start and full bloom
- Start and full fruit set

2.7.1.2. Final Height of Plants

2.7.1.3. Final Stem Diameter

2.7.2. Production Parameters

- Number of fruits per plant:
- Average weight of fruits per plant:
- Production plant:
- Yield per treatment for all emissions:

2.7.3. Quality Parameters

- Length of fruit
- Fruit Size
- Dosage vitamin "C"

The content of vitamin "C" in the fruits of pepper is calculated according to the method [5] as a result:

A quantity of 10g fresh fruit pulp is reduced by bringing together 50 ml of hydrochloric acid (HCl 2%) and let rest for 10 minutes. The mixture filtered into a 100 ml beaker.

The determination of vitamin "C" consists of two steps:

Step 1:

• Take 10ml of filtered extract it and put in an Erlenmeyer flask, add 30 ml of distilled water, then add 1 ml of solution of potassium iodide (KI 1%) finally added 2 ml of 5% starch solution.

• The prepared solution is titrated with potassium iodate (KINO3 N/1000) until a blue coloration

• Record the volume in ml of potassium iodide (KI) used for titration

2nd Step:

A control under the same conditions was performed, 10 ml of extract it are replaced by an equal amount of 2% hydrochloric acid.

3. Results and Discussion

3.1. Growth Parameters

3.1.1. Followed by Flowering and Fruit Set

Every two days, from the beginning of flowering to full fruit set, counting the first blooming flowers and the number of those who are knotted was established regularly.

The results obtained are shown in Table 2.1 and illustrated in Figure 2.1.

Table 2.1. *Maturity according to two (days).*

Growth stages	Treatments	
	T_1	T_2
early flowering	115	115
full bloom	133	128
Early fruit set	139	135
full fruit set	154	149

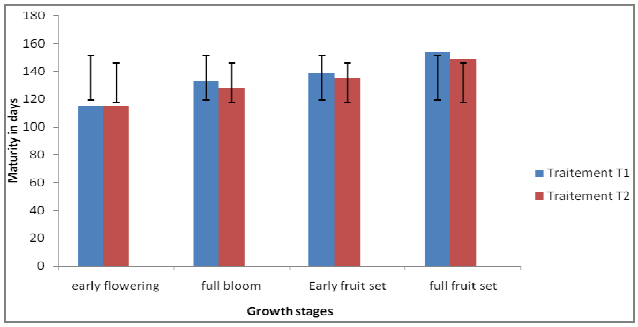

Figure 2.1. *Maturity in days according to the two treatments.*

According to Table 2.1 and Figure 2.1, we find that there is little difference between the two treatments in terms earliness, as:

- The two treatments entering flowering equal time of 115 days after planting early stage.

- Treatment T_2 between full flowering stages before the T_1 treatment with a difference of 5 days.

- For early stages fruit set and fruit set full, we note that the treatment T_2 precedes T_1 processing about 5 days.

3.1.2. Final Height of Plants (cm)

For the final plant height, the results are presented in Table 2.2 and illustrated in Figure 2.2.

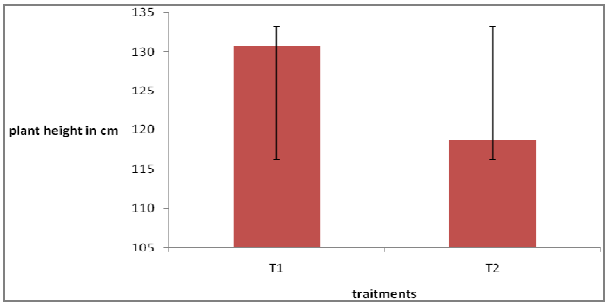

Figure 2.2. *The mean final height of plants in each treatment.*

Table 2.2. *The final plant height in cm of each treatment*

Plants \ treatments	T_1	T_2
Average treatment	130,73±8,17	118,66±5,40

The analysis of variance (Table 2.3) shows a very highly significant difference between the two treatments studied, the T1 treatment fertilized with DERMAZOTO N_{11} has a large final height of 130.73 cm from the T2 treatment fertilized with manure farm which is 118.66 cm.

Table 2.3. *Sum of the squares determined by ANOVA on height final height of plants in each treatment*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	1092.033	1	1092.033	22.72	0.000< 5%	very highly significant
total	1345.76	23	48.06			

3.1.3. Final Stem Diameter

The results obtained for the final diameter of the stems of the plants are shown in Table 2.4 and illustrated in Figure 2.3.

Table 2.4. *Final diameter rods cm.*

Plants \ treatments	T_1	T_2
Mean diameter by treatment	2,16±0,21	2,00±0,31

The analysis of variance (table 2.5), there is no significant difference between the two treatments studied final stem diameter parameter for all plants with a probability of 0.11.

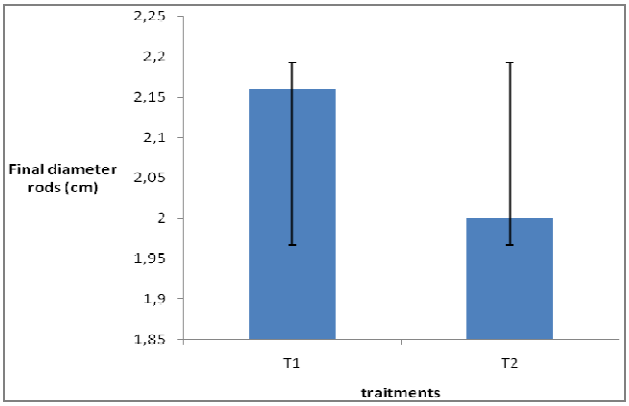

Figure 2.3. *Final average diameter of stems per treatment.*

Table 2.5. *Sum of the squares determined by ANOVA on height final height of plants in each treatment*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	0.198	1	0.198	2.721	0.110> 5%	not significant
total	1345.76	28	48.06			

3.2. Production Parameters

3.2.1. Number of Fruits per Plant

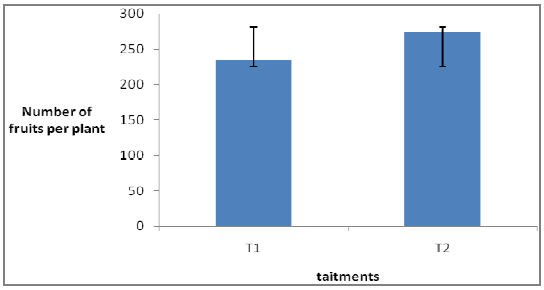

Figure 2.4. *Total number of fruits per treatment*

The results of the parameter number of fruit per plant and per treatment are shown in Table 2.6 and illustrated in Figure 2.4.

Table 2.6. *Number of fruits per plant per treatment*

Plants \ Treatments	T_1	T_2
total per Treatment	234±4,38	273±6,51

According to the above table 2.6 and figure 2.4, we see that the treatment T_2 promotes fruiting with only 234 to 273 fruits fruits for 234 fruits pour le T_1. These fruits are harvested all 15 plants on file 5 times.

The analysis of variance (Table 2.7) shows that there is no significant difference between the two treatments, as the value p-value = 0.21 is greater than the risk of error α = 5%.

Table 2.7. *Sum of the squares determined by ANOVA on total number of fruits per treatment*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	50.7	1	50.7	1.643	0.21> 5%	not significant
total	864	28	30.857			

3.2.2. Average Weight of Fruits per Plant

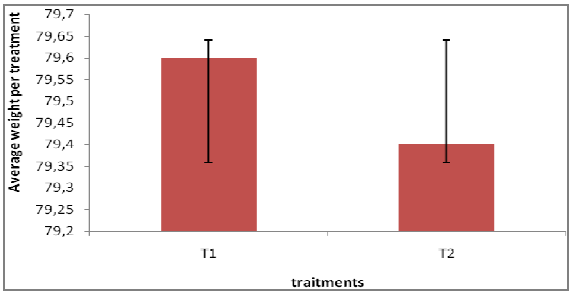

Figure 2.5. *average fruit weight per plant and per treatment.*

The results obtained for the average weight of fruits per plant parameter are shown in Table 2.8 and illustrated in Figure 2.5.

Table 2.8. *Average fruit weight per plant per treatment*

Plants \ Treatements	T_1	T_2
average fruit weight	79,46±13,28	79,40±11,70

From table 2.8 and figure 2.5, we see that there is no difference between the two treatments for the average weight of fruits per plant parameter and treatment, and this is confirmed by statistical analysis where the value of P = 0.99 is much higher than the risk of error α = 5% (table 2.9).

Table 2.9. *Sum of the squares determined by ANOVA on fruit weight per plant and per treatment*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	0.027	1	0.027	0	0.99> 5%	not significant
total	4390.91	28	156.818			

3.2.3. Production Plant

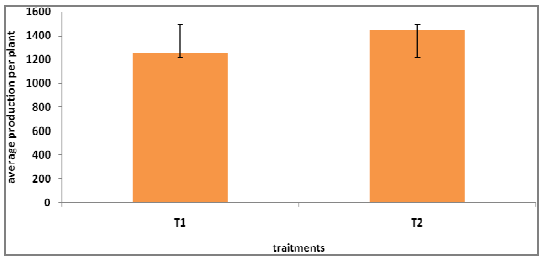

Figure 2.6. *Average production per plant in (g).*

The results obtained for the plant output parameter are presented in Table 2.10 and illustrated in Figure 2.6.

Table 2.10. *Production per plant in (g).*

Plants \ Treatements	T_1	T_2
Average production per plant	1255,33±421,22	1452,33±591,81

The results shown in Table 2.10 and illustrated in Figure 2.6 show that the T_2 outweighs the T_1 with an average production of 1452.33 g 1255.33 g per plant against, without a significant difference between the two treatments, and this is confirmed by the value P-value = 0.303 which is greater than the risk α = 5% (table 2.11).

Table 2.11. *Sum of the squares determined by ANOVA on average production per plant*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	291067.5	1	291067.5	1.643	0.21> 5%	not significant
total	738 7416.667	28	263 836.31			

3.2.4. The Total Fruit Yield by Treating the Whole Greenhouse

Table 2.12. *Total yield fruits per treatment in (Kg)*

Crops \ Traitements	T_1	T_2
first harvest	18	24
2nd harvest	61	88
3rd harvest	80	114
4th harvest	86,5	51,2
5th harvest	108	132
total	353,5±33,90	409,2±44,36

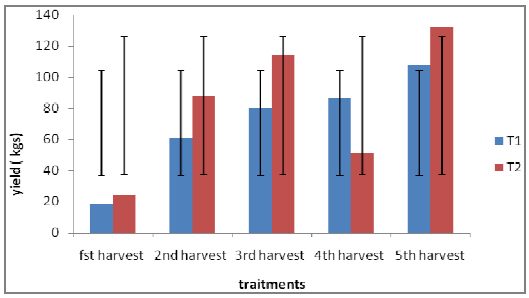

Figure 2.7. *Total yield by treating the whole greenhouse.*

The results for the total fruit yield per treatment for all emissions are shown in Table 2.12 and also illustrated in Figure 2.7

From Table 2.12 and Figure 2.7 above, we observe a change in the output as as time passes for both treatments, and this is due to the growth and development of plants with the conditions climate: temperature in particular are mentioned, it begins to ensure optimum required .

On the total performance of the two treatments for the entire greenhouse, analysis of variance revealed that there was no significant difference between T_1 and T_2 (Table 2.13).

Table 2.13. *Sum of the squares determined by ANOVA on yield by treating the whole greenhouse*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	310.249	1	310.249	0.199	0.667> 5%	not significant
total	12471.312	8	1558.914			

3.3. Quality Parameters

3.3.1. Average Length of Fruits per Plant

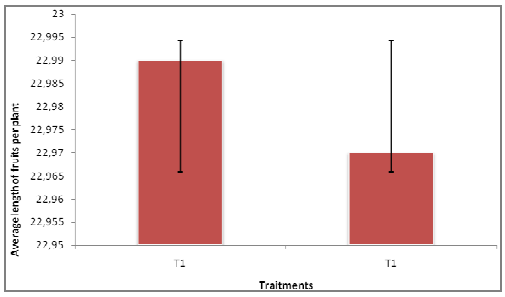

Figure 2.8. *Average length of fruit per treatment.*

The average lengths of fruit of each plant on file and each treatment are shown in table 2.14 and illustrated in figure 2.8.

Table 2.14. *Average length of fruits per plant per treatment*

Traitements / Plants	T1	T2
Average length of fruits per plant	22,99±1,58	22,97±1,37

From table 2.14 and figure 2.8, we see that the two treatments are consistent with the average for T_1 and T_2 of 22.99 cm and 22.97 cm respectively. However the analysis of variance confirmed that there is no significant difference between them (table: 2.15).

Table 2.15. *Sum of the squares determined by ANOVA on Average length of fruit per treatment.*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	0.004	1	0.004	0.002	0.968> 5%	not significant
total	61.506	28	2.197			

3.3.2. Average Diameter of Fruits per Plant

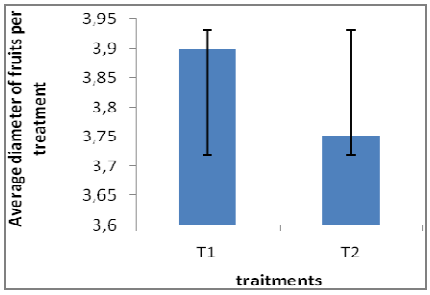

Figure 2.9. *Mean diameter of fruits per treatment*

The results obtained for the average diameter of the fruits per plant parameter are presented in table 2.16 and illustrated in figure 2.9.

The results of the analysis of variance (2.17) between the two treatments show no significant difference and it is shown in figure 2.11 and shown in Table 2.16.

Table 2.16. *average diameter of fruits per plant per treatment.*

Treatements / Plants	T_1	T_2
Average diameter of fruits per plant per treatment	3,90±0,31	3,75±0,25

Table 2.17. *Sum of the squares determined by ANOVA on Average length of fruit per treatment.*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	0.169	1	0.169	2.113	0.157> 5%	not significant
total	2.236	28	2.197			

3.3.3. The Vitamin Content "C"

Pepper fruits are generally rich in ascorbic acid. Therefore, we recommended dosage of vitamin "C" in the fruits harvested from the plants by the two treatments.

The results are shown in table 2.18 and illustrated in figure 2.10.

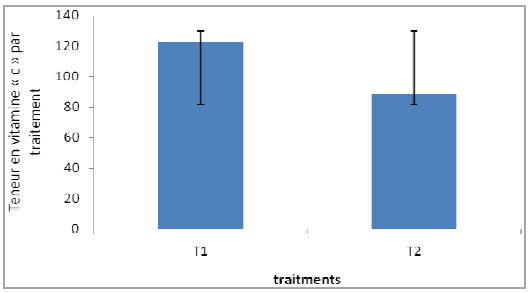

Figure 2.10. *Content of vitamin 'C' treatment*

Table 2.18. *Content of vitamin "C" fruit mg/100g.*

Treatements	T_1	T_2
Samples by different treatments	122,62±6,15	88,52±3,53

The analysis of variance (table 2.19) shows that there is a highly significant difference between the two treatments for the amount of vitamin "c" in the pepper fruits.

Fruits that are harvested from plants fertilized with DEMAZOTO N_{11} are the richest in ascorbic acid with an average value of 122.62 mg/100g against 88.52 mg/100g for fruit harvested from plants fertilized with manure farm.

Table 2.19. *Sum of the squares determined by ANOVA on Content of vitamin 'C'.*

Source	Sum of squares of deviation	ddl	Variance	F	P value	observations
Treatments	2782.107	1	2782.107	110.241	0< 5%	significant
total	100.947	4	25.237			

4. Conclusion

Environmental conditions (soil, climate, ...) are the main limiting factors in the success of crops.

On the nutrition plan, the mineral medium in which the plant feeds, plays a crucial role in growth, development and particularly on its performance, which is dependent on the quality of the nutrition of the plant.

At the end of our work, whose aim was to study the effect of a solid fertilizer waste hides and skins, used manure from the bottom, on a culture of pepper greenhouse, compared to a witness; the results obtained during our experiments allow us to draw the following conclusions:

4.1. In View Precocity

For both treatments, the results showed no treatment has an effect on the early relative to each other, the difference in days for no longer than 5 days, either the stage for full flowering stage or full fruit set.

4.2. From Growth Perspective

For setting the final height of the plants, there was a significant difference between the two treatments. Treatment T_2 recorded the highest average, this can be explained by its high nitrogen (11%).

Reverse against final stem diameter, there is no significant difference between the two treatments.

4.3. From the Point of Production for

No significant difference was recorded for all the parameters.

So the DERMAZOTO N11 and farmyard manure gave a number of fruits, average weight and yield almost the same.

4.4. In Terms of Quality

For calibration (diameter and length of the fruit), no significant difference was observed between the two treatments. However, there is a significant difference between treatments for vitamin content "C", the T_1 treatment outweighs the treatment T_2 with an average value of 122.62 mg/100g against 88.52 mg/100g respectively.

This fertilizer (DERMAZOTO N_{11}) newly introduced in Algeria (1st try) has not brought the expected results on the cultivation of peppers driving emissions, given the non-significant difference for most of the parameters studied.

Recommendations

Before judging the fertilizer adversely, knowing that this is the first trial of its kind on pepper cultivation in greenhouses, it is desirable to repeat well experience, under other conditions and different cultures to better conclude its quality and its extension throughout Algeria.

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