International Journal of Biological Sciences and Applications
2014; 1(4): 182-189
Published online October 30, 2014 (http://www.aascit.org/journal/ijbsa)
ISSN: 2375-3811

Keywords
Pepper (*Capsicum Annuum* L.)
Cultivation Technology,
Field Crops,
Fertilizing,
Super Absorbent (MGF)

Received: August 27, 2014
Revised: October 25, 2014
Accepted: October 26, 2014

The influence of a contribution in super absorbent MGF (Miracle Green Formula) Performance pepper (*Capsicum annuum* L.)

Kebour Djamila*, Boutekrabt Ammar, Snoussi Sid Ahmed, Menouer Hadjer

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

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

Citation
Kebour Djamila, Snoussi Sid Ahmed, Menouer Hadjer. The Influence of a Contribution in Super Absorbent MGF (Miracle Green Formula) Performance Pepper (*Capsicum Annuum* L.). *International Journal of Biological Sciences and Applications.* Vol. 1, No. 4, 2014, pp. 182-189.

Abstract
The pepper has always been and remains a kind of base for growing vegetables in Algeria, producing for the consumer edible fruit fresh, whose nutritional value changes due to its high content of vitamin C. These new crops were sold in Algeria without first testing their behavior in traditional ponds for growing peppers, existing in the most favorable for the cultivation of vegetables in our country area. Given the ecological plasticity reduced the variety of peppers for field crops in the native literature we developed the idea of logic also tested in parallel a super absorbent (MGF) on the yield of this crop. The main objective of this research is the use of good management of water resources will be a major asset to the overall development of a country and to check to what extent the technique proposed here can help to achieve this goal and acquire references to the direct effects of superabsorbent on agricultural development and performance of the pepper and the water savings to improve production quality and quantity.

1. Introduction

The food has always been based on the use of vegetables which accounted for a large part of the balance of our nutrition [1].

Meet the food demands of the population of a country characterized by agricultural land (UAA) limited (2.3% of the total land area) and a population growth rate estimated at 3.1% per year, not can be achieved without solving all the problems and obstacles that hinder and impede its productive power. In response, it has become imperative to think about increasing our production and profitability of our farm including those of market gardening land.

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

Vegetables, because of their wealth of vitamins, minerals and protein to provide a balanced human diet. Among these, we find the pepper (*Capsicum annuum* L.), which is essentially rich in vitamin C [2].

Increase production by increasing acreage is possible only marginally so. It is

therefore necessary to achieve the objective, to increase yields by introducing improved agricultural techniques.
One issue that needs our attention is the management of water resources.

Demographic Republic of Algeria belongs to the geographical area of the "Middle East and North Africa" (MENA) and almost all of its territory (84%) is classified as desert. According to the United Nations Food and Agriculture Organization, the country with a total area of 238 million hectares cultivated only 3.54% of its territory, while it has a potential cultivable 40 million hectares, or 16.8%.

This can be explained by, among other restricted access to water resources needed access to culture. In Algeria, the average annual rainfall all zones combined is around 89 mm^3. Although this average varies greatly from one region to another, the fact remains that according to the United Nations Programme for Development (UNDP), not only the country does not currently have the required amount of water to its overall development but demand will increase over the years due to population growth and rising living standards of the population. Currently, 65% of the amount of water used annually in the country mobilized for agricultural purposes.

The aim of this essay is not to make a forecast on the evolution of these trends or the effects on social stability and food security of Algeria. Rather, it is clear that the proper management of water resources will be a major asset to the overall development of the country and to check to what extent the technique proposed here can help to achieve this goal and gain references on the direct effects super-absorbent MGF on agricultural development and performance of the pepper and the water savings to improve production quality and quantity.

2. Materials and Methods

2.1. Site of Experimentation

Our experiment was conducted in the technical institute of market gardening and industrial crops (ITCMI), it is located North -West center of Algiers (Staoueli).

Agropédoclimatique context:
-Latitude North: 35-45°.
-Altitude: 22m.
-Texture Soil: Sandy-Loam.

2.2. Plant Material

The species used in our experiment is the pepper (*Capsicum annuum* L.), variety of choice is a hybrid F_1 "Lipari".

The choice of this variety was based in part on the availability of plants suitable for transplantation, and the other on its varietal characteristics.

It is a vigorous, productive, early, pointy fruit sweet flavor, resistant to TMV virus (tobacco mosaic), and well suited to all forms of cultures.

2.3 The Previous Crop

The previous crop that has been grown the previous season 2012-2013 is pepper *Capcicum annum* L.

2.4. The Experimental Conditions

2.4.1. Location of Drill

Sowing took place on: 23 October 2013; in pots filled with peat and grape pomace at two seeds per pot.

Transplantation took place on 12 December 2013 in a greenhouse CASSDEP to a metal structure covered with plastic polyethylene film, the surface of the film needed to cover the greenhouse is 500qsm.

The greenhouse measuring 50m long, 8m wide and 3.5m high, with an area of 400qsm and is oriented north-south direction. The ventilation of the greenhouse is provided by the two side windows and doors of the greenhouse.

Figure 2.1. *Instead of transplanting.*

2.5. The Experimental Setup

The experimental setup is an experimental design without control of heterogeneity to a single factor studied and repetition (completely randomized).

At this level, there are two treatments that will be compared with each treatment contains two lines, they are:

T_0 : without MGF.
T_1 : with MGF.

2.6. Description of Super-Absorbent "Polymer"

2.6.1. Chemical Composition of the Polymer

The super absorbent (MGF) compounds are cross-linked polyacrylate and water retaining agents.

The product is partially neutralized with potassium hydroxide and ammonia, two essential plant nutrients. On contact with water, the super absorbent to swell rapidly, turning into a gel which retains water and water-soluble nutrients.

2.6.2. Specifications of Super-Absorbent (MGF)

The table 2.1 shows the specifications of super absorbent.

Table 2.1. *Data Sheet super absorbent.*

Chemistry	
Crosslinked polyacrylate salts neutralized with Potassium and ammonia	
Absorption capacity	
Distilled water	minimum. 250 ml/g
0,125% NPK 14-12-14	minimum. 100 ml/g
Redistribution of water to the plant	*95 %*
Useful life in soil	> 5 années
Toxicology / Ecology	*Non-toxic to plants, the soil , the micro organisms in the soil and groundwater.*

Source: [3]

2.7. Crop Management

2.7.1. Setting Up the Nursery

The nursery phase was established on 23 October 2013 in pots with two seeds per pot for 50% and a seed for 50% of other pots.

The seed bed was composed of a mixture of peat and marc. The mixture was well imbued with Dithane M_{45} at the rate of a spoon to 4 liters of water to fight preemptively against fungal diseases.

2.7.2. Driving in the Nursery

Driving nursery was characterized by:

• A watering every four days to conserve soil moisture.

• An operation weeding done every 15 days during the period of nursery stage regularly.

However, no application of mineral fertilizers and pesticides have been conducted at nursery stage, that is to say, during the period from sowing to transplanting.

2.7.3. Soil Preparation

According to Anonymous (2010) [4], the soil should be prepared well in advance and loosened about 10-50 cm deep to prevent it from being hollow at the time of planting.

To achieve the objective assigned to work the ground, it is necessary to cover a number of transactions, while preserving soil structural stability.

During soil preparation, plowing was made on 28 October 2013; using a mechanical tractor equipped with plows, which return the land to a depth of 30-50 cm and reducing weed aims.

Disking was performed one week prior to transplant in order to pulverize the lumps created by plowing, followed by a smoothing and leveling the soil crumbling.

Soil fertilization was ensured by adding the following fertilizers:

- Organic Fertilizer at 60 tonnes of well-rotted manure per hectare.
- Mineral basic fertilization at a rate of 50kg of N.P.K (15.15.15).

2.7.4. Implementation of the Test

2.7.4.1. Burial MGF Polymer

After performing soil preparation, burial MGF polymer 2 lines due to 180g / plant was made on: 03 December 2013.

2.7.4.2. Transplantation

The transplant was performed on: 12 December 2013.

Seedlings were transplanted at a distance of 0.4m on the rows and 1m between the lines. Each treatment has two lines and each line contains 107 seedlings.

2.7.5. Maintenance of Culture

To achieve the objectives of the work, the following has been applied:

Fertilization, irrigation, plant health care, weeding, ...

2.7.5.1. Fertilization

To improve soil fertility, we used a mineral fertilizer based cleaning soluble fertilizer. Such fertilizers contain two main components, this nitrogen and potassium.

The dose of these two elements differs depending on the phenological stage of the plant.

Fertilization is done once a week.

Table 2.2. *Summarizes the amount of fertilizer at each stage.*

Phenological stage	**initial**	**flowering**	**fruit set**	**fruit set mid- magnification**
fertilizer	3Kgs d'N + 2Kgs de K	3Kgs d'N + 2Kgde K	2Kgs d'N + 3Kgs de K	2Kgs d'N + 3Kgs de K
duration	once a week	once a week	once a week	once a week

2.7.5.2. Irrigation

Irrigation was carried out by the drip irrigation system. This type of irrigation allows a meaningful water savings. The distribution of water is spaced as follows:

Between the ramps : 1m.

Between the drops: 0.4m.

Installation of the network drop by drop took place on 02 December 2013. The irrigation system connected to a metering pump that ensures fertigation culture.

Figure 2.2. *INSTALLATION of drip irrigation system.*

Irrigations were evaluated according to the ETP emissions.

Why a weather shelter was needed which was equipped with a mini-max thermometer and evapomiter Piche in the words of Bouchet

$$ETM = ETP \times KC$$

with:

KC varies with the stage of plant development:

-KC: Initial stage (planting) = 0.6.

-KC: Developmental stage = 1.05.

-KC: End = 0.9.

2.7.5.3. Weeding

To fight against weeds that come into competition with the crop establishment and generate substantial losses, we conducted a mechanical weeding seen its effectiveness.

Mechanical weed control is an essential method in agriculture. In addition to its struggle against weeds, mechanical weeding improves and maintains soil structure, promotes the flow of water and soil biological activity. Mechanical weeding, weeds can be destroyed in three ways:

- Severing roots,
- Uprooting seedlings
- Recovery of seedlings.

2.7.5.4. Trellising

It was established with a string hanging, playing the role of a support designed to avoid stalk breakage caused by the weight of fruit.

2.7.5.5. Harvesting

The fruits are harvested at the green stage, the first harvest was made on 07 April 2014. Well-developed and well-grained green fruits are plucked in a very delicate way. During our test, we collected 5 times due to a crop every 15 days.

2.8. The parameters Studied

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

2.8.1. Growth Parameters

2.8.1.1. Maturity

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

Early and full bloom.

Early and full fruit set.

Full magnification.

For all stuck to each treatment plants.

For this, observations were made every two days, knowing that:

- The early flowering is committed to the development of 10% of the first flowers of the same treatment,
- The stadium full bloom is committed to the development of 75% of the first flowers of treatment,
- The stadium early fruit set fruit set is determined by 10% of the first flowers of treatment,
- The stadium full fruit set is determined at 75% of the first flowers tied with treatment.

2.8.2. Production Parameters

We considered four production parameters for comparing the performance of both treatments, there are:

2.8.2.1. Number of Fruits per Plant

By simply counting fruit harvested each stuck plant.

2.8.2.2. Average Weight of Fruits per Plant

This is the total weight of all fruits harvested divided by the number of harvested fruit stuck on the same plant.

2.8.2.3. Production per Plant

The estimation of production per plant is done by the sum of the weights of the fruits harvested per plant per treatment and divided the total by the number of plants per treatment (10 plants stuck).

2.8.2.4. Performance by Treatment for All Emissions

The total weight of harvested fruit of plants of each treatment to the entire greenhouse to compare the two treatments on a large scale.

2.8.3. Quality Parameters

2.8.3.1. Fruit Length

Using a tape measure, we measured the length of each fruit harvested plants stuck.

2.8.3.2. Fruit Size

Using a caliper, we measured the size of each fruit harvested plants stuck.

2.8.3.3. Quality Parameters

According to [5], citric acid is the main organic acid fruit tomato, this acid and others are responsible for the acidity of the fruit vegetable species, they play an important role in the taste of the tomato.

It took three fruits, which have been shredded and from this was taken juice 10g to which was added 25ml of distilled water in a volumetric flask of 200 ml, in the following

100ml were collected.

At the end were added 3-4 drops of phenolphthalein in 100 ml, the whole is subjected to titration with sodium hydroxide N /10, until the appearance of the color pink.

The acidity is calculated by the following expression:

$$\text{Titratable acidity \%} = \text{1N volume (ml) of NaOH} \times 0064$$

With: 0064: conversion factor of the citric acid.

2.8.3.4. B-dosage vitamin C

The content of vitamin C in fruits of pepper is calculated using the method **[3]** (Hela, Manaa and Zid, 2008) as follows:

-a quantity of 10g of fresh fruit pulp is reduced by placing in the presence of hydrochloric acid 50 ml (2% HCl) and then let rest for 10 minutes.

-give filtering the mixture in a 100ml beaker.

The determination of vitamin C through two 2 stages:

First step:

- Take 10 ml of the filtered extract it and place in an Erlenmeyer flask, add 30 ml of distilled water, then add 1 ml of potassium iodide solution (KI 1%), and finally we add 2 ml of 5% starch solution.
- The prepared solution is titrated with potassium iodate (N KINO3 / 1000) until the appearance of a blue coloration.
- Record the volume in ml of potassium iodate used for titration.

Second Step:

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

The calculation:

$$X = 100 \times N.V1\text{-}0.88 / GV$$

X : Ascorbic acid mg / g of product analysis

N : Potassium iodate volume resulting from the difference between the first indicator and titration assay

V1 : Total volume of the extract obtained for analysis.

V : Initial volume of extract to be analyzed.

G : Amount of analyte.

3. Results and Discussion

3.1. Followed by Flowering and Fruit Set

Every two days, from the beginning until the full flowering fruit set, a Counting the first blooming flowers and the number of those knotted was established regularly.

The results obtained are shown in Table 3.1 and shown in figure 2.2.

Table 3.1. *Maturity based on the two treatments.*

Growth Stages	Treatments	
	T_0	T_1
Beginning of flowering	23/10/2013 au 20/02/2014	23/10/2013 au 20/02/2014
full flowering	23/10/2013 au 06/03/2014	23/10/2013 au 01/03/2014
Early fruit set	23/10/2013 au 15/03/2014	23/10/2013 au 10/03/2014
full fruit set	23/10/2013 au 27/03/2014	23/10/2013 au 23/03/2014

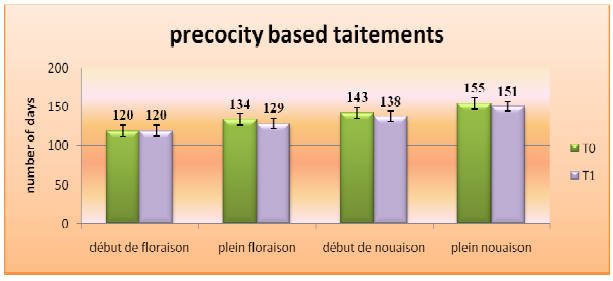

Figure 3.1. *Maturity in days according to the two treatments.*

From table 3.1 and figure 3.1, we see that there is a slight difference between the two treatments in terms earliness, as:

- Both treatments come in early flowering stage in a time equal 120 days after planting.
- The T_1 treatment at full bloom stage before treatment T_0 with a difference of 5 days.
- For the early stages and full fruit set fruit set, we note that the T_1 treatment ahead of the T_0 treatment of about 5 days.

3.2. Production Parameters

3.2.1. Number of Fruits per Plant per Treatment

The results of the parameter number of fruits per plant for each treatment are shown in table 3.2 and illustrated in figure 3.2.

Table 3.2. *Number of fruits per plant per treatment*

plant \ Treatment	T_0	T_1
Plant1	14	22
Plant 2	20	30
Plant 3	17	19
Plant 4	21	25
Plant 5	12	20
Plant 6	15	22
Plant 7	17	15
Plant 8	21	21
Plant 9	26	30
Plant 10	15	19
average	17,8±3,96	22,3±4,56

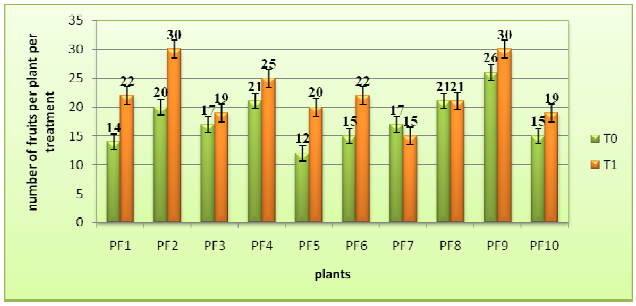

Figure 3.2. *Number of fruits per plant per treatment*

According to figure 3.2, the best production was represented by plants 2 and 9 (T_1) treatment with 30 fruits per plant.

Lower production was marked by the 5 (T_0) treatment plant with 12 fruits.

Since the probability value for the F test is less than 0.05, there is a statistically significant difference between the average number of fruits per plant in a processing level to another level the 95%.

The extensive test multiple class treatments into two homogeneous groups X.

3.2.2. Average Fruit Weight

The results of the parameter average fruit weight are shown in table 3.3 and illustrated in figure 3.3.

Table 3.3. *Average fruit weight in grams.*

Treatment / plants	T_0	T_1
plant1	70,33	61,36
plant 2	80,5	90
plant 3	50	86,84
plant 4	78,75	88
plant 5	65	82,5
plant 6	86,66	61,36
plant 7	90	70
plant 8	78	69,04
plant 9	76	90
plant 10	86,4	86,5
average	76,164±11,30	78,56±11,19

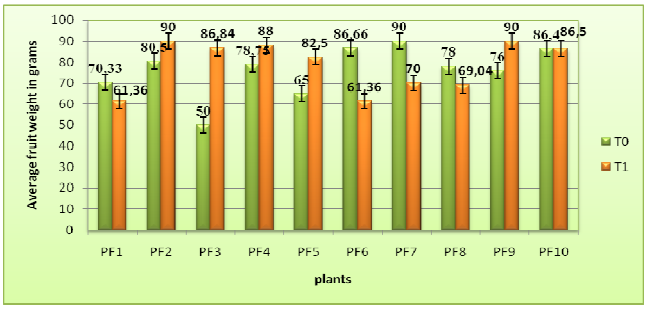

Figure 3.3. *Average fruit weight in grams.*

The most powerful value was recorded at 2 plants 9 (T_1) treatment and 2 ($T_{0)}$ treatment plant with 90g.

The lowest weight is represented by the 3 plant T_0 witness.

As the probability value for the F test is greater than or equal to 0.05, there is no statistically significant difference between the means of the average fruit weight (g) of a level of other treatments at 95% confidence.

The extensive test multiple class treatments in one homogeneous group X.

3.2.3. Production Plant

The results of the production per plant parameter for each treatment are shown in table 3.4 and illustrated in figure 3.4.

Table 3.4. *Production per plants in g.*

Treatment / plants	T_0	T_1
plant1	984,62	1350
plant2	1610	2700
plant3	850	1650
plant4	1653,75	2200
plant5	780	1650
plant6	1300	1350
plant7	1530	1050
plant8	1638	1450
plant9	1976	2700
plant10	1296	1643,5
average	1361,83±371,41	1774,35±541,56

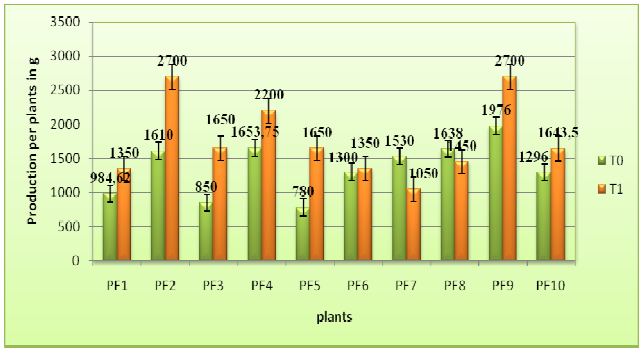

Figure 3.4. *Production per plants in g.*

From figure 3.4, we notice that the production is 2700 grams at 2 plants 9 (T_1) treatment.

As against the lowest production was recorded by the plant 5 (T_0) witness.

Analysis of variance shows that there is no statistically significant difference between the means of production of a plant treatment level to the other at 95% confidence.

3.2.4. Rendement Total Fruit per Plant and per Treatment

The results for the total fruit yield per plant and per treatment for the entire greenhouse are shown in table 3.5 and also illustrated in figure 3.5.

Table 3.5. *Total yield of plants per treatment.*

Treatment / crops	T_0	T_1
1st crop	35	22
2nd crop	80	112,5
3rd crop	108	82
4th crop	96,5	70
5th crop	50,5	122
average	74±27,46	81,7±35,42

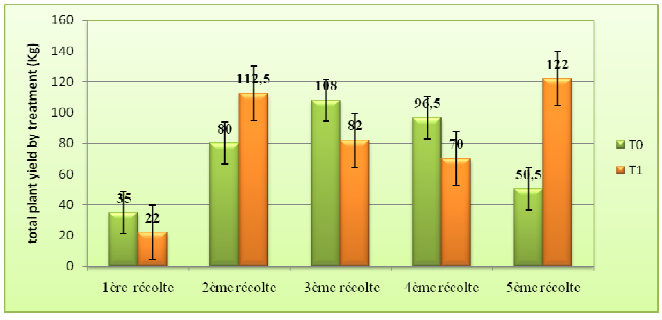

Figure 3.5. *Total plant yield by treatment*

From figure 3.5, we can see that the best performance was recorded at the fifth harvest in the treatment T1 tested with 122kg.

Analysis of variance shows that there was no statistically significant difference between mean treatment of a crop at the other at 95% confidence.

The extensive test multiple class treatments in one homogeneous group X.

3.3. Quality Parameters

3.3.1. Fruit Length

The average length of each plant fruit stuck and each treatment are shown in table 3.6 and illustrated in figure 3.6.

Table 3.6. *Average length of fruits per plant per treatment.*

Treatments / plants	T_0	T_1
plants 1	19	22
plants 2	16	23
plants 3	22	23
plants 4	23	22
plants 5	21	24
plants 6	22	21
plants 7	20	24
plants 8	24	22
plants 9	20	21
plants 10	20	25
average	20,7±2,14	22,7±1,26

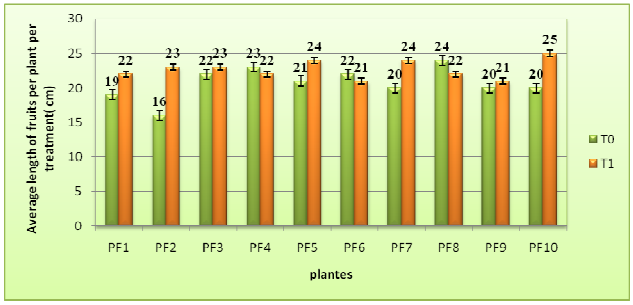

Figure 3.6. *Average length of fruits per plant per treatment.*

The effective value was represented by the plant stuck 10 (T_1) treatment with 25cm, and the shorter length was marked by the 2 plant (T_0) control with 16cm.

The analysis of variance, revealed a significant difference between averages of the treatments studied at 95%.

The extensive test multiple class treatments into two homogeneous groups X.

3.3.2. Mean Diameter of Fruits per Plant per Treatment

Results Parameter Average fruit diameter are shown in Table 3.7 and shown by figure 3.7.

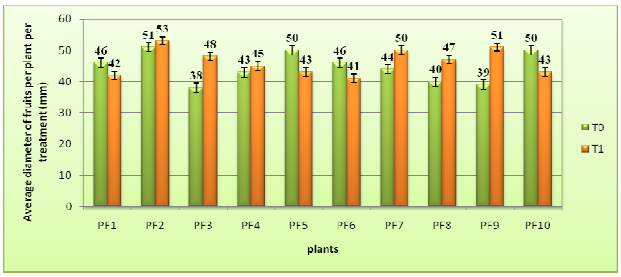

Figure 3.7. *Average fruit diameter in mm.*

Table 3.7. *Average diameter of fruits per plant per treatment.*

Treatments / plants	T_0	T_1
plants 1	46	42
plants 2	51	53
plants 3	38	48
plants 4	43	45
plants 5	50	43
plants 6	46	41
plants 7	44	50
plants 8	40	47
plants 9	39	51
plants 10	50	43
average	44,7±4,49	46,3±3,92

According to figure 3.7, we see that fruit diameter represented by the largest processing plant 2 (T_1) with 53mm.

The smaller diameter was recorded by the fruit of 3(T_0) treatment plant.

The analysis of variance, reported no significant difference between the two treatments.

The extensive test multiple class treatments in one homogeneous group X.

3.3.3. The Titratable Acidity

The results for the parameter of titratable acidity are shown in table 3.8 and figure 3.8.

Table 3.8. *Titratable acidity.*

Treatments / samples	T_0	T_1
Sample 1	0,24	0,24
Sample 2	0,24	0,23
Sample 3	0,31	0,23
average	0,26±0,03	0,23±0,004

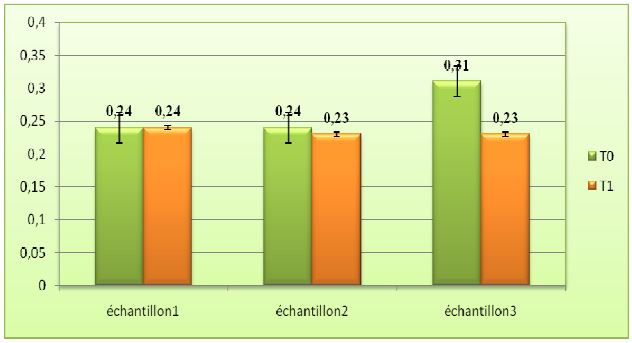

Figure 3.8. *Titratable acidity.*

In wanting to compare the two treatments, the T0qui gave the best result with a value of 0.31.

The analysis of variance, shows that there was no significant difference between the two treatments.

The extensive test multiple class treatments in one homogeneous group X.

3.3.4. Vitamin "C"

The fruits of pepper are generally rich in ascorbic acid. Therefore, we recommended dosage of vitamin "C" in fruits

harvested from the plants by the two treatments.

The results are shown in table 3.9, and illustrated in figure 3.9.

Table 3.9. *the vitamin "C".*

Treatments / samples	T_0	T_1
sample1	84,62	130,32
sample 2	91,52	126,22
sample 3	89,42	138,32
Average	88,52±2,88	131,62±5,02

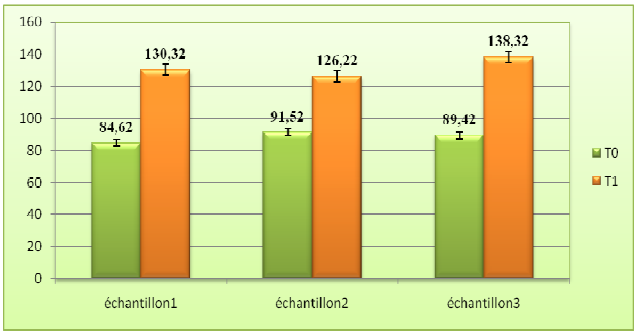

Figure 3.9. *Vitamin "c".*

Figure 3.9, shows that fruits of plants representing the treatment tested stuck T_1 are rich in Vitamin "C" compared to the treatment T_0.

As the probability value for the F-test is less than 0.05, there is a statistically significant difference between the average content of vitamin "C" from one level to the other treatments in the 95%.

The extensive test multiple class treatments into two homogeneous groups X.

4. Conclusion

At the end of our work which aimed to evaluate the influence of a contribution in super absorbent MGF (Miracle Green Formula) on the development and yield of pepper, knowing that this polymer recently introduced in Algeria is not toxic to plants, soil, living organisms in the soil and groundwater.

The results of the statistical analysis obtained allow us to draw the following conclusions:

Regarding the number of fruits per treatment, it was found that there was a significant difference between the two treatments studied which has took the effective T_1 value.

By cons, no significant difference was recorded regarding the three parameters of production that are average weight per fruit processing, production per plant and total yield per treatment.

Speaking on the length of fruits per treatment, the analysis showed that there is a significant difference between treatments studied, including the T1 recorded the highest 24 cm value.

As regards the diameter of the fruit and parameters titratable acidity, no significant difference is recorded regardless of the treatment.

The results for the determination of vitamin "C" showed that there is no significant difference.

The positive results obtained in our experiments are intended to guide the position of principle regarding interest in Algerian agriculture to develop the use of super absorbent MGF and to target regions and cultures where it is likely to be most effective.

References

[1] Gruben G. J. H., et EL Tahir I. M., (2004): *Capsicum annuum* L.. (Editors). Plant Resources of Tropical Africa 2. Vegetables. PROTA Foundation, Wageningen, Netherlands / Backhuys Publishers, Leiden, Netherlands / CTA, Wageningen, Netherlands, p154.

[2] Anonyme, 2010 : Production du poivron en Algérie. Ministère de l'agriculture et de développement rural.

[3] Ted W. VanDer Gulik, 2006: Irrigation fertilisante en Colombie- Britannique : pratiques et tendances, p 7-8.

[4] JACQUES P. ET PIERRE J., 2005: La fertilisation organique des cultures : les bases. Edition FABQ, page 26.

[5] LE clech B., et Hachler B., 2003 : agriculture biologique, éthique, pratique et résultat. Edition ENITA, bordeaux, 314p.