The impact of different organic fertilizers of urban origin on the caliber and yield of two vegetable crops

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***Abstract* - The application of the organic fertilizers in soils is essential to maintain soil fertility and increase crop productivity. Organic fertilizers improve the physical, chemical and biological characteristics of soils.**

Different compost derived from the composting of the waste fermentable, are used in this experiment. The composts have different particle sizes (10 mm and 40 mm). The latter has basic pH values (8-9), C/N ratios varying between 17, 7 and 19, 7. The organic matter rate, answer to norm NFU 44 051 (varying between 34% and 48%). The analyses of the elements trace metallic show that the rates are in conformity with the international standards of organic amendments. The results of phytotoxicity show that the composts are mature.

The different compost (fine and coarse) added to mineral fertilizers gives of the rates high of potatoes (50 %, 50, 8 %) and turnips (59, 5%, 62 %), whose the caliber is over 55 mm. This shows that compost is a necessary additive to minerals fertilizers since it acts as an organic amendment for the fertility of arable soils, and it acts as a mineral amendment for a better productivity of the different cultures.

Keywords: Urban fermentable wastes, co-composting, organic amendments, recycling for agricultural, soil fertilization.

I. INTRODUCTION

In Algeria, the department of Chlef has an agricultural vocation. More than 203 000 hectares, is the Useful Agricultural Area (UAA) and 18 000 hectare is the Agricultural Area Irrigated (AAI) (Directorate of agriculture of the department, 2015). Soils in the Chlef area are generally clayey. The textures of the agricultural soils are loamy and sandy with an intermediate environment, clay-loamy and silty-sandy. All these types of soils are very poor in organic matter. The rate of this latter varies between 0% and 2%. Therefore, the application of organic amendments to these soils is a necessity. At Chlef currently, contributions of mineral fertilizers (NPK) are 40,913 quintals / year and the needs are 24,548 quintals / year. This lack is brought by the compost

The organic matter, while maintaining structural stability, makes the soil structure more permeable to water and air [11]. It serves as a support and nourishment for biological activity [11], and also retains wate

The aim of this work is to establish experimentally the agricultural use of the compost produced from the green waste and the fermentable waste urban solid. This experiment is devoted to the effects of the compost on the yield and on caliber of potatoes and turnips.

According to the Directorate of Agricultural Services (DAS) of Chlef (2016), the potato production occupied the second place after the culture of the cereals. More than 2,081 hectares in Boukadir, Ouled Fares, Chlef and Oued Fodda are reserved for this crop. The minimum production rate for this crop is 250 quintals/ha, with an average of 350 to 360 quintals/ha. The maximum is 400 quintals/ha. But this maximum is obtained with a dose and a half of mineral fertilizers. And the turnip occupies the fourth place after the cultivation of other vegetables. The harvest rate is 79 quintals/ha.

II. MATERIALS AND METHODS

A. Composition of various composts

The composition of the composts is based on their initial substrates:

- composting of 25% of urban fermentable with 75% of the green waste gives compost 1 (C_1).
- composting of 50% urban fermentable with 50% of the green waste gives compost 2 (C_2).
- composting of 75% of urban fermentable with 25% of the green waste gives compost 1 (C_3).
- composting of 100% fermentable urban gives compost 4 (C_4).

The various composts were screened with 10 mm and 40 mm square mesh sieves (table I).

TABLE I. Symbol of the composts after sieving

Sieving of the compost	≤ 10 mm	≤ 40 mm
Compost C_1	$C_{1/10}$	$C_{1/40}$
Compost C_2	$C_{2/10}$	$C_{2/40}$
Compost C_3	$C_{3/10}$	$C_{3/40}$
Compost C_4	$C_{4/10}$	$C_{4/40}$

B. Compost quality parameters

The measurements and analysis of the parameters must be reliable and decisive for the efficiency of the process and for the use of the compost produced as an organic amendment.

Fig. 1 represents a descriptive diagram of the experimental protocol for all measurements and analyzes of the physicochemical parameters of the product composts

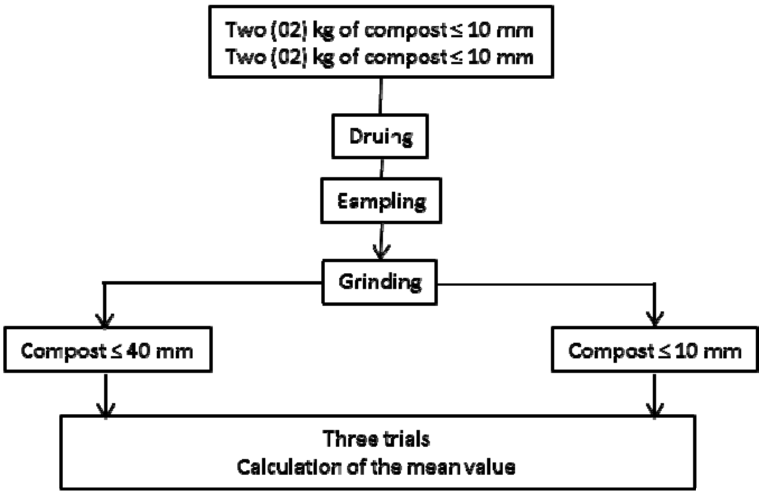

Fig. 1. Descriptive diagram of the experimental protocol

Table II lists the methods for analysis the quality and maturity parameters of the different composts produced.

TABLE II. Methods of analysis

Quality of compost	% Organic Matter /DM (Dry Matter)	% Carbon/DM	Rate N (NTK)	Rate of the Elements Metallic Trace	Rate of the Fertilizer Elements
Methods	Loss to fire (Norm NFU 44 160)	[9]	Dosage of Kjeldahl	Method of analysis ISO 11 460 of June 1995.	Method of analysis ISO 11 460 of June 1995.
Maturity of compost	Germination test	Germination index test	-	-	-
Methods	World Health Organization, 1978.	[13]	-	-	-

ISSN (Print) : 2319-8613
ISSN (Online) : 0975-4024

1) Agronomic trials

The agronomic trials were carried out on the agricultural plots of the station agronomical experimental of University of Chlef.

2) Choice of soil

-The soil selection criteria were: - Sol of the agronomic experimental station; - Uncontaminated soil that has not received no treatment (no organics amendments and no mineral fertilizers) since five (5) to six (6) years; - Irrigation of agricultural crops ensured by the station employees; - Station closed to ensure crop safety with regard to animals; - Availability of the station employees for all work (seeding and harvesting).

D. Methods of random blocks

1) Description

The various treatments are nineteen (19) with a control (T). The control contains neither mineral fertilizer nor compost. The dose M of mineral fertilizers is 10 quintals per hectare NPK 15.15.15

Three (3) quintals per hectare of urea 46% N and M 'represents half of the latter. On the other hand, all doses of the different compost are at dose D (30 tons per hectare).

The doses of the various compost and the doses of the minerals fertilizers in the three blocks (B_i, B_{ii} and B_{iii}) are random and at the same time it is a repetition of these treatments. That is, the three trials are identical in the three blocks except that the doses in the mini plots are random (table III).

The area of each mini-plot is six square meters (6 m^2) for growing potatoes. For the cultivation of turnips, each mini-plot has an area of four square meters (4 m^2). In each block, the mini plots are separated by one meter (1 m). The three blocks are separated by two meters (2 m) from each other.

TABLE III. Distribution of treatments by mini-plots in the three blocks

Blocks	Block i 3 m 0,5 m				Block ii 1,5 m				Block iii			
0,5 m	T 2 m	M	$C_{1/10}$	$C_{1/40}$	M	T	$C_{2/10}$	$C_{2/40}$	$C_{2/10}+M/2$	$C_{2/10}+C_{2/40}$	$C_{1/10}+C_{1/40}$	T
Seeding of potatoes	$C_{2/10}$	$C_{2/40}$	$C_{1/10}+C_{1/40}$	$C_{2/10}+C_{2/40}$	$C_{1/10}$	$C_{1/40}$	$C_{1/10}+M$	$C_{1/10}+M/2$	$C_{1/10}+M$	$C_{1/40}$	$C_{1/10}$	$C_{2/40}+M$
	$C_{1/10}+M$	$C_{1/10}+M/2$	$C_{2/10}+M$	$C_{2/10}+M/2$	$C_{2/10}+M$	$C_{2/40}+M$	$C_{1/10}+C_{1/40}$	$C_{2/10}+C_{2/40}$	$C_{1/10}+M/2$	$C_{2/10}+M/2$	$C_{2/10}+C_{2/40}+M$	$C_{2/10}+M/2$
	$C_{1/10}+C_{1/40}+M$	$C_{1/10}+C_{1/40}+M/2$	$C_{2/10}+C_{2/40}+M$	$C_{2/10}+C_{2/40}+M/2$	$C_{1/10}+M/2$	$C_{1/10}+M/2$	$C_{2/10}+M/2$	$C_{2/40}+M/2$	$C_{1/10}+C_{1/40}+M/2$	$C_{1/10}+M$	$C_{2/10}+C_{2/40}+M/2$	$C_{1/10}+C_{1/40}+M$
1,5 m	$C_{3/40}+M$	$C_{3/40}+M/2$	$C_{4/40}+M$	$C_{4/40}+M/2$	$C_{1/10}+C_{1/40}+M/2$	$C_{1/10}+C_{1/40}+M$	$C_{1/10}+M$	$C_{1/40}+M$	M	$C_{4/40}$	$C_{3/10}+M/2$	$C_{4/10}$
	T 2 m 2 m	M'	$C_{3/10}$	$C_{3/40}$	M'	T	$C_{4/10}$	$C_{4/40}$	$C_{4/10}+M'/2$	$C_{4/10}+C_{4/40}$	$C_{3/10}+C_{3/40}$	T
Seeding of turnips	$C_{4/10}$	$C_{4/40}$	$C_{3/10}+C_{3/40}$	$C_{4/10}+C_{4/40}$	$C_{3/10}$	$C_{3/40}$	$C_{3/10}+M'$	$C_{3/10}+M'/2$	$C_{3/10}+M'$	$C_{3/40}$	$C_{3/10}$	$C_{4/40}+M'$
	$C_{3/10}+M'$	$C_{3/10}+M'/2$	$C_{4/10}+M'$	$C_{4/10}+M'/2$	$C_{4/10}+M'$	$C_{4/40}+M'$	$C_{3/10}+C_{3/40}$	$C_{4/10}+C_{4//40}$	$C_{3/10}+M'/2$	$C_{4/10}+M'/2$	$C_{4/10}+C_{4/40}+M'$	$C_{4/10}+M'/2$
	$C_{3/10}+C_{3/40}+M'$	$C_{3/10}+C_{3/40}+M'/2$	$C_{4/10}+C_{4/40}+M'$	$C_{4/10}+C_{4/40}+M'/2$	$C_{1/10}+M'/2$	$C_{1/10}+M'/2$	$C_{4/10}+M'/2$	$C_{4/40}+M'/2$	$C_{3/10}+C_{3/40}+M'/2$	$C_{1/10}+M'$	$C_{4/10}+C_{4/40}+M'/2$	$C_{3/10}+C_{3/40}+M'$
	$C_{3/40}+M'$	$C_{3/40}+M'/2$	$C_{4/40}+M'$	$C_{4/40}+M'/2$	$C_{1/10}+C_{1/40}+M/2$	$C_{1/10}+C_{1/40}+M'$	$C_{3/10}+M'$	$C_{3/40}+M$	M'	$C_{4/40}$	$C_{3/10}+M'/2$	$C_{4/10}$

: Irrigation canals; : spray nozzles.

Watering was provided with watering channels having spray nozzles at their ends. Watering is ensured during several phases: emergence, tuberisation and maturity of the two crops.

Weeding and hoeing were made three weeks after the first watering and weed emergence.

This mounding limits the contamination of the tuber and favors tuberization. This operation was carried out when the stems reached 25 cm in height. It was repeated during the period of plant growth

Note: Urea 46 % N has been used after the vegetation was lifted.

All the various compost are in the dose **D** = 30 Tons/Hectare

M = 10 quintals/hectare NPK 15.15.15+ 3 quintals/hectare urea 46 % N

M/2 = Half the dose M

M'= 5 quintals/hectare NPK 15.15.15 + 1.5 quintals/hectare urea 46 % N

M'/2= Half the dose M'

III. RESULTS AND DISCUSSION

A. Quality of composts

Organic amendments are composts whose elements trace metallic must not exceed the limit values of international standards. They are rich in nutrients and contain no impurities.

1) Chemical elements

The chemical elements of the various composts are in agreement with other chemical characteristics of composts derived from fermentable (table IV).

TABLE IV. Chemical characteristics of the composts

Compost	$C_{1/10}$	$C_{1/40}$	$C_{2/10}$	$C_{2/40}$	$C_{3/10}$	$C_{3/40}$	$C_{4/10}$	$C_{4/40}$	NFU 44 051
pH/DM	8	8	9	9	9	9	8	9	-
% OM/DM	38	37	39,5	37	38,8	36	34	32	≥ 20% MB
% C/DM	19	18,5	19,75	18,5	19,4	18	17	16	≥ 10
% N-(NTK)/DM	1,01	1.02	1,0	1,01	1.20	1,02	0,96	0,99	<3%
C/N	18,8	18	19,8	18,3	16,2	17,6	17,7	16,1	16, 2

The rate of the carbon is measured in relation to the volatile matter, which is determined by the loss at fire. The values of the C/N ratios show that, the higher the C/N ratio, the less the nitrogen is readily available. These results confirm that nitrogen is in the organic form, indicating that the various composts are of the organic amendments [8]. The values of the pH vary between 8 and 9. What indicating that the composts are mature. According to Avnimelech and al [1], mature composts are characterized by pH values ranging from 7 to 9. The rates of the Organic matter are in compliance with various international standards.

2) Fertilizer elements

The mineral elements (P and K) and trace elements (Ca, Mg and Na) act on the physical, biological and chemical stability of soils [3].

TABLE V. Fertilizer elements

Compost	Kg **P**/kg	Kg **K**/kg	Kg **Na**/kg	Kg **Mg**/kg	Kg **Ca**/kg
$C_{1/10}$	9,8	10,4	8,1	4,5	15,3
$C_{1/40}$	9,7	9,5	7,5	4,3	14,5
$C_{2/10}$	15,6	7,4	9,9	5,5	19,5
$C_{2/40}$	13,6	7,1	9,2	4,9	17,9
$C_{3/10}$	5,4	9,1	7,3	5,6	27,2
$C_{3/40}$	4,4	8,3	7,1	5,2	25,2
$C_{4/10}$	9,6	8,2	6,7	5,6	16,3
$C_{4/40}$	7,7	7,5	6,4	5,3	13,6

According to table V, the analysis shows that the various composts are rich in: phosphorus, potassium, sodium, magnesium and calcium. These results are in agreement with those of Compaoré [6] in Ouagadougou. And with, those of Soumaré [12]. And, those of Charny [5]. And, those of Koledzi [10]. These elements can be provided by fermentable urban solid [5].

3) Impurities

The methods of analysis the inert components in the compost consists in destroying the non-synthetic organic matter by attack oxidative at bleach (13 %). This method is mentioned in norm NFU 44 051, applicable to organic amendments and soil organic composts. The results show the presence of oxidizing and non-oxidizing organic matter (plastic, paper-board, unclassified fuels, glass, textile, wood, coal and fine materials (≤ 2mm)). Composts contain impurities (Table VI), but the rates do not exceed the limits recommended by NFU 44 051. These results confirm that it is important to mention that the different composts are the result of a tri-composting process. The composts obtained may be marketed and may be used in agriculture.

TABLE VI. Rate of impurities (/DM)

Compost	**C_1**	**C_2**	**C_3**	**C_4**	**NFU 44 051**
Impurities	%/DM				
plastic	0,1	0,2	0,4	0,7	< 0,8%
Paper-cardboard	3.4	11,3	11,5	3,4 12	-
Metals	0,1	0,1	0,2	0,3	< 2%
Glass	0,1	0,2	0,4	0,7	< 2%
Unclassified fuels	5,6	10	13,2	14,8	-
Textile	0,1	0,2	1,6	2,9	
OMO	35	30,9	29,7	24,5	
Fine Matter < 2mm	29,4	26,6	26,1	20,9	

OMO: Organic Matter Oxidizing; DM: Dry Matter

4) Elements Trace Metallic

In this study, five (05) elements were analyzed: Cadmium, Copper, Lead, Nickel and Zinc. The rates of these elements do not exceed the limit values recommended by the various international standards (table VII).

TABLE VII. Rate of Elements Trace Metallic

EMT (mg/kg /DM)	**$C_{1/10}$**	**$C_{1/40}$**	**$C_{2/10}$**	**$C_{2/40}$**	**$C_{3/10}$**	**$C_{3/40}$**	**$C_{4/10}$**	**$C_{4/40}$**	NFU 44051	Allemagne Biowaste Ordinance I	Australie ARMCANZ*	Canada BNQ**
Cd	0,2	0,2	0,6	0,9	0, 6	0,3	0,4	0,5	3	1	3	3
Cu	72,6	73,7	83,7	84,8	94,3	93,7	95,5	92,0	300	70	200	100
Pb	41,1	42,5	55,7	55,9	73,5	83,7	92,6	93,9	180	100	200	150
Ni	12,2	12,0	16,5	14,3	22,8	21,9	36,6	35,7	60	35	60	62
Zn	185,0	146,3	227,0	244,0	350,6	357,3	460,3	448,0	600	300	250	500

B. Compost maturity

1) Phytotoxicity

The germination tests and the germination index tests are a means of evaluating the toxicity associated with the incorporation of compost in the soil.

The rate of germination index of cress and lettuce is significantly higher with the 50% compost water (CW) dose. Similarly, the highest corn and wheat germination rates were obtained with 50% of compost (table VIII). According to Compaoré [6], the germination varies with the dose of the compost brought and the type of crop. The results are in agreement with those found by Compaoré [7]. So the compost is ripe and can be used as organic amendments.

TABLE VIII. Rate of germination index and rate of germination

Dose	**100% E**				**50%E+50%CE**				**100%CE**			
Compost	C_1	C_2	C_3	C_4	C_1	C_2	C_3	C_4	C_1	C_2	C_3	C_4
Cress	100	100	100	100	78	85	74	72	69	67	56	52
Lettuce	100	100	100	100	82	81	61	67	68	66	52	54
Dose	**100% S (Sand)**				**50%S+50%C**				**100%C**			
Compost	C_1	C_2	C_3	C_4	C_1	C_2	C_3	C_4	C_1	C_2	C_3	C_4
Wheat	100	100	100	100	80	70	70	60	60	60	50	50
Corn	100	100	100	100	70	60	60	50	60	60	50	50

C. Agronomic valorization

It should be noted that the turnips (fig. 2) were seeded one year after seeding the potato (fig. 3).

Fig. 2. Agronomic trials of the turnips

Fig. 3. Agronomic trials of the potatoes

1) Fine compost

Yield of potatoes

A dose of 30 tons/hectare of $C_{1/10}$ or $C_{2/10}$ compost added to a mineral fertilizer M dose yielded better potato yields (24 tons /hectare and 25 tons/hectare) compared to yields of control (17 tons and those of the M/2 doses (19 tons/hectare).On the other hand, a dose of $C_{1/10}$ added to half a dose of mineral fertilizers gave yields of 26 tons/hectare at 30 tons/hectare. The compost mixed with half-doses of mineral fertilizers yield significant yields. These results show that nutrient deficiencies can be brought by the compost amendments (Fig. 4). So the farmers can use half a dose of mineral fertilizers instead of one dose for better soil fertility and a high rate of productivity in healthy cultivation for the human and for the environment.

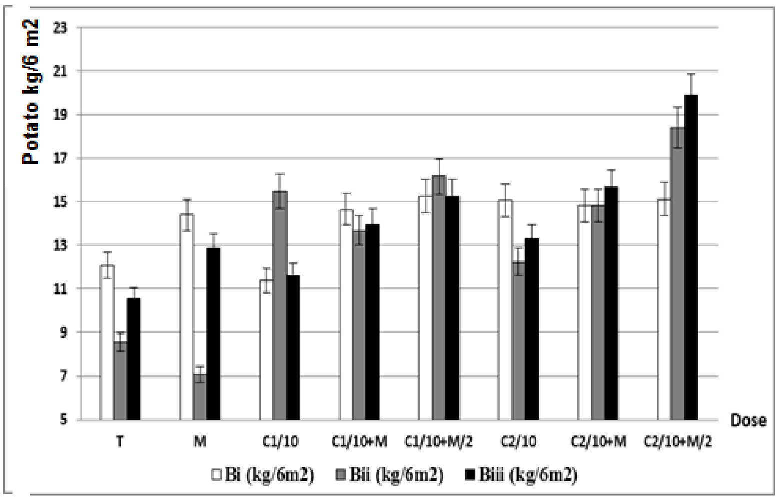

Fig. 4. Yield of potatoes

Yield of turnips

According to figure 3, the yields of the turnips brought by the $C_{3/10}$ and $C_{4/10}$ compost, are higher than those of the witness (T) and those of the dose M' (fig. 5).

The yield of the dose (M' + $C_{3/10}$) is 7.93 kg/2m^2 and this of the dose ($C_{4/10}$ + M'), are important compared to this of witness and this of the dose M'. These results are due to the delayed effects of the amendments compost $C_{1/10}$

and $C_{2/10}$ which were seeded a year before with the potatoes. The organics amendments act on soil structure in contrast to mineral fertilizers.

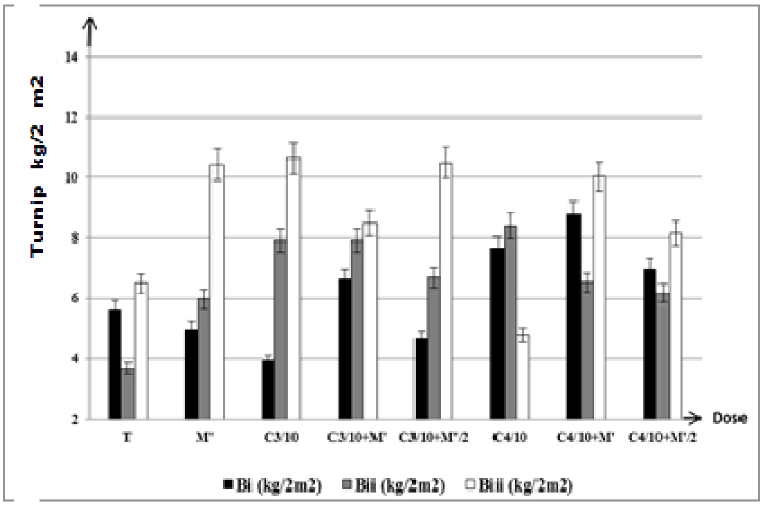

Fig. 5. Yield of turnips

2) Coarse compost

Yield of potatoes

The doses ($C_{1/40}$ + M/2) and ($C_{2/40}$ + M/2)) give 31 tons/hectare and 32 tons/hectare (fig. 6) of potato. These yields are superior to those obtained with compost associated with a dose M (24 tons/hectare and 31 tons/hectare). Several hypotheses can be considered: - The depressive effect is not related to the characteristics of the compost, but to the applied doses [2]; - the potato is favorably more sensitive to half a dose of mineral fertilizers added to a dose of compost.

These results confirm those found with fine compost. So, it is enough to farmers to use half a dose of mineral fertilizers with a dose of organic amendments (compost), to guarantee the needs and the unavailability of mineral fertilizers at the appropriate times. For this purpose, local production of the compost is essential in developing countries.

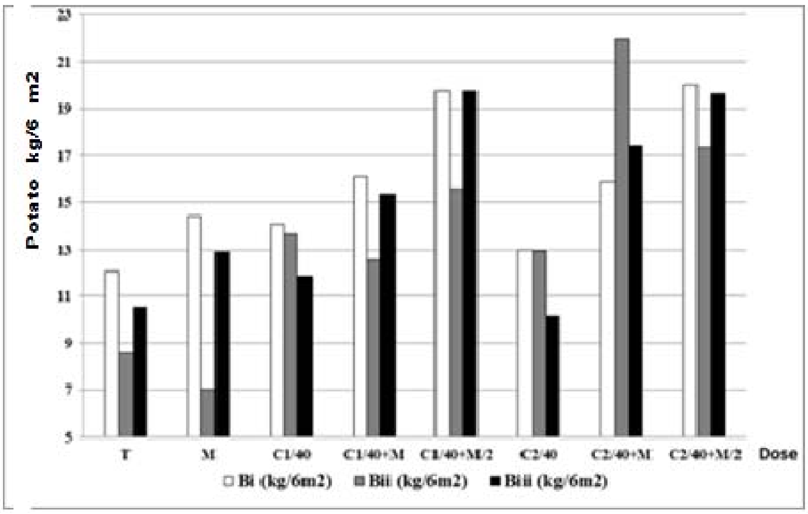

Fig. 6. Yield of potatoes

Yield of turnips

The doses ($C_{3/40}$ + M') and ($C_{4/40}$ + M'), yielded significantly higher yields than those given by the witness mini-parcel and the mini-parcel of mineral fertilizer dose (M') (fig. 7). The highest yield is obtained with the ($C_{4/40}$ + M') dose (44 tons/hectare). This result is related to the phosphorus content of Compost 4 compared to compost 3. The inputs of organic amendments rich in mineral elements and in trace elements seem to correct the deficiency in soil nutrient used in these agronomic trials.

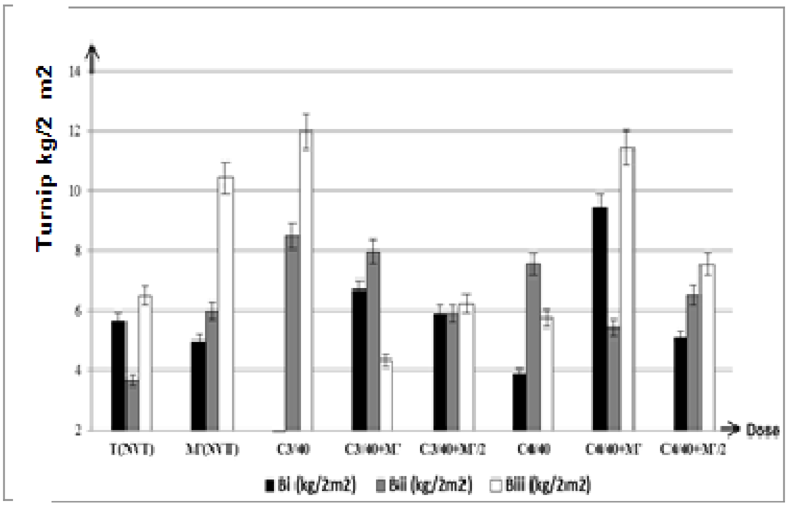

Fig. 7. Yield of turnips

3) Comparison of potatoes yields

A dose of 30 tons/hectare of organic amendments contains 300 kg N/hectare, 300 kg P_2O_5/hectare and 240 kg K_2O/hectare. And a dose M of mineral fertilizers contains ten (10) quintals/hectare of NPK 15.15.15 and three (03) quintals/hectare of urea 46 % of N. The mixing of these various fertilizers is necessary for the improvement of the texture of the arable soils. According to table IX, the results show that the yields of potato with the fine compost are more significant than those obtained with the coarse compost. Thus, fine compost has an advantage for vegetable crops.

TABLE IX. Potatoes yields obtained with fine compost and the coarse compost

Treatment	**T**	**M**	**$C_{1/10}$**	**$C_{1/10}$+M**	**$C_{1/10}$+M/2**	**$C_{2/10}$**	**$C_{2/10}$+M**	**$C_{2/10}$+M/2**
Tons/Hectare	17	19	21	24	26	23	25	30
Treatment	**T**	**M**	**$C_{1/40}$**	**$C_{1/40}$+M**	**$C_{1/40}$+M/2**	**$C_{2/40}$**	**$C_{2/40}$+M**	**$C_{2/40}$+M/2**
Tons/Hectare	17	19	22	24	31	20	31	32

According to the Directorate of Agricultural Services (DAS) of Chlef, the potatoes production (table X) varies between 28 tons/hectare and 39 tons/hectare. In Chlef the farmers use two doses of mineral fertilizer (2 M). And sometimes, two and a half doses (2, 5 M) to obtain these yields. These doses provide an excess of nitrogen that turns into nitrates. Nitrates are easily soluble in water.

So those that are not assimilated by plants are carried away by the runoff of the waters and pollute the ground and the ground water, while the compost allows for the supply of organic nitrogen which decomposes progressively.

Table X. Potatoes production at Chlef (DAS, 2016)

Year	**Season**		**Off-season**		**Total**	
	Area (hectare)	Production (tons/hectare)	Area (hectare)	Production (tons/hectare)	Area (hectare)	Production (tons/hectare)
2014	2614	**42**	**1987**	**35**	**4601**	**39**
2015	2188	32	2223	25	4411	28

3.1) Effect of the fine compost added to fertilizers minerals on the caliber of the potatoes and the caliber of the turnips

To better understand the effect of organics amendments added to fertilizers minerals on the yield of potatoes and turnips, the knowledge of the caliber of these two crops becomes necessary.

Caliber of the potatoes

In the case of fine compost added to fertilizers minerals, the percentage of potatoes, who's the caliber greater than 55 mm ($\geq$ 55 mm) is 53, 8 %. For cons, the rate is 9, 5 % in the witness mini-parcel (without compost and without mineral fertilizers). These results show that fine compost acts as organic amendments and as organic fertilizers since they improve crop productivity and soil fertility (fig. 8).

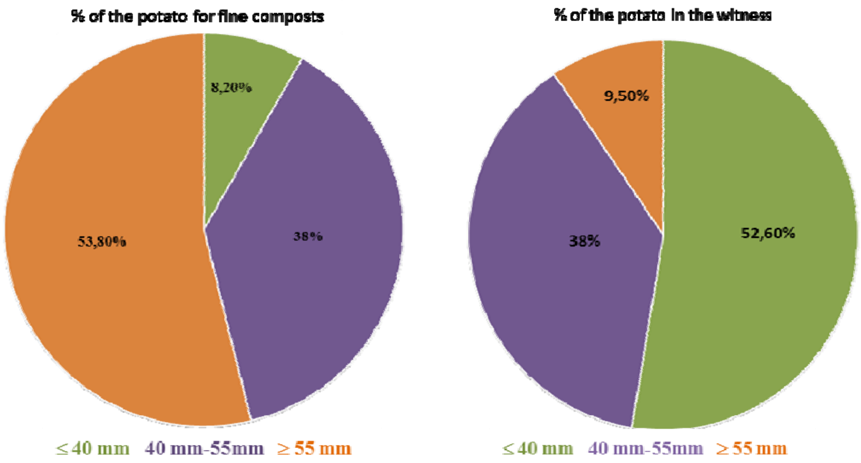

Fig. 8 Effect of fine compost added to fertilizers minerals on the potatoes caliber

Caliber of turnips

In the case of the application of the fine various compost added to the mineral fertilizers in the mini plots, the percentage of turnips with a caliber greater than 55 mm (≥ 55 mm) is 58,5%.The rate of this culture is 20, 5 % in the witness (fig. 9). These results are consistent with those found with potato. According to Soltner [11], good plant growth is not only related to the main fertilizing elements (nitrogen, phosphorus and potassium), but to the availability of trace elements (Mg, Zn, Cu, Na and Ca). This result is due to the richness of the soil of the fertilizers elements since the turnips were sown a year after the potatoes.

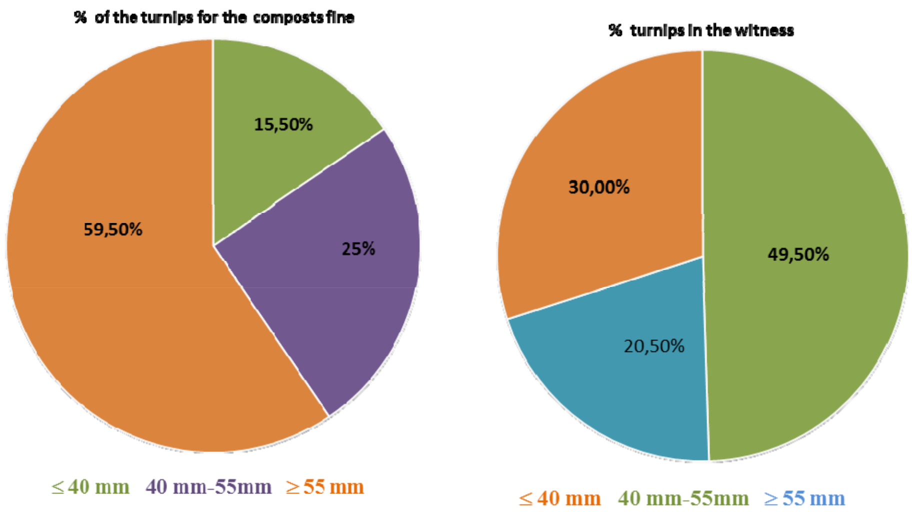

Fig. 9. Effect of fine compost added to fertilizers minerals on the turnips caliber

3.2) Effect of coarse compost added to fertilizers minerals on the caliber of the potato and turnips

Caliber of the potatoes

The most significant potato percentages are those with caliber greater than 55 mm (≥ 55 mm) and those with the caliber is 40 mm to 50 mm. These rates are significantly higher than those obtained with the witness (fig. 10). These findings confirm that fine or coarse compost added to fertilizers minerals ameliorate the chemical, physical and biological characteristics of the soil and subsequently act as organic fertilizers.

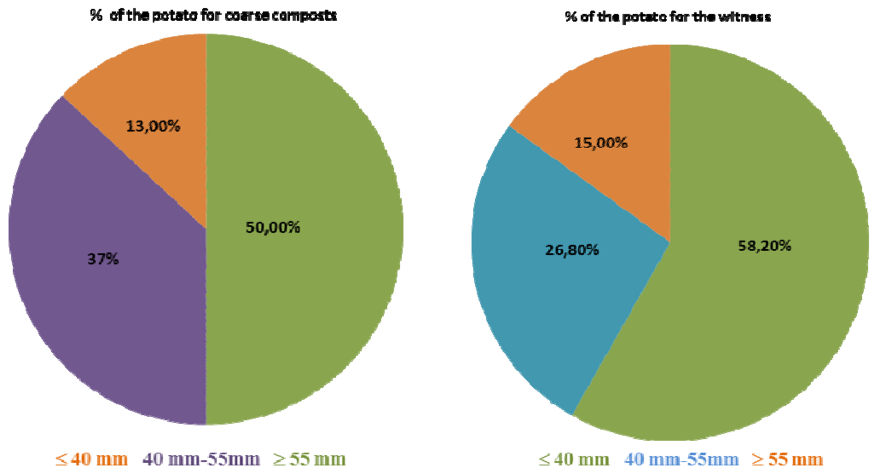

Fig. 10. Effect of coarse compost added to fertilizers minerals on the potatoes caliber

Caliber of turnips

In the case of coarse compost added to mineral fertilizers, the turnover rate greater than 55 mm (≥ 55 mm) is significantly higher than that obtained by the control (Figure 11).These results are consistent with those found with the fine compost. According to Bouzaine [4], a soil treated with organics amendments, becomes rich in organic matter and microbial biomass over time.

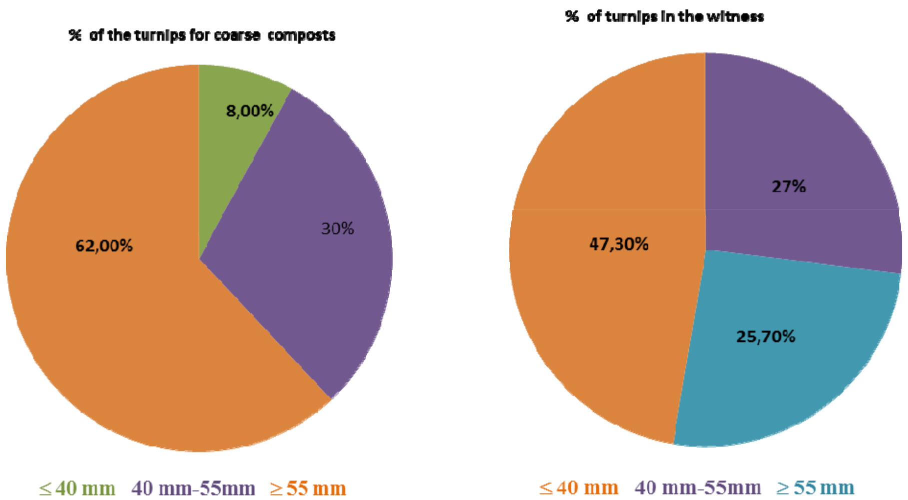

Fig. 11. Effect of coarse compost added to fertilizers minerals on the turnips caliber

IV. CONCLUSION

The agronomic trials showed that the different compost of dimensions 10 mm and 40 mm improve the fertility of the soil, they act like organic amendments and as organics fertilizers.

A dose or half a dose of mineral fertilizer added to a compost dose does not affect the yields of both crops.

In addition, the results show that the highest yields of both crops above 55 mm (≥ 55 mm) were obtained in the case where the compost is added to the mineral fertilizer. These findings show that compost is a complement to mineral fertilizer.

The results of this experiment are information tools, which show that the compost produced in Chlef, largely cover the needs of the fertilizers minerals. The composting has an advantage for Chlef and the departments neighboring because the organic matter of the compost can compensate of the deficiencies of the organic matter of agricultural soils.

This research / action have shown that composting is a suitable solution and confirms the importance and importance of the integration of this treatment in the waste management sector in the developing countries. However, conditions are necessary such as:

- Periodic characterization and composition of the compostable categories (Greens wastes and urban solid wastes);

- Follow-up of the composting process;
- Quality and maturity analysis of the compost;
- Agronomics trials;
- Monitoring of the soil structure and the profitability of the cultures.

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