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GERMINATION TEST OF FENUGREEK IN OLIVE POMACE COMPOST

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ABSTRACT

Morocco is among the major olive-growing countries around the Mediterranean, its productivity increases from one year to the next, especially after the introduction of the Green Morocco plan, which opts for an increase in the olive-growing area by the year 2020. The increase in productivity especially in olive oil is strictly accompanied by an increase in waste generated after crushing. The objective of this study is to value the olive pomace compost as a soil amendment, at different concentrations, during the fenugreek germination.

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MATERIALS AND METHODS

Experimental design

The experiment consists of germinating 25 fenugreek seeds in moderate percentages of olive pomace compost (Table 1), in order to identify the fertilizing power of this compost and to determine the optimal useful dose for plants.

Table 1. Percentages of compost used in the experiment

Olive pomace percentage	0%	5%	10%	15%	20%	25%
Soil percentage	100%	95%	90%	85%	80%	75%

The compost used in this study is composed of olive pomace (43%) and cattle manure (57%). Each percentage was tested three times.

Plant material

Fenugreek is a Fabaceae family member. This specie has several varieties. It adapts to various types of soils. The best soils are between permeable clay and sandy. It is generally cultivated in bour without additional irrigation in areas with rainfall between 300 and 450 mm (Bernard, 1999).

Measured parameters

Several parameters were regularly monitored during this germination test :

- The germination rate is calculated by the formula of Belcher and Miller (1974) :

$G\,\% = 100 \times \frac{\sum n}{N}$ Where n is the number of sprouted seeds and N is the number of tested seeds.

- The vigour is determined by the formula of Abdul-Baki and Anderson (1973) :

$VI = \%\,G \times SL$ Where SL is the length of the seedling in cm and %G is the germination rate.

- Germination kinetics: this involves daily calculation of the germination rate under the different compost concentrations (Hajlaoui et al., 2007)

- Dry matter: Just after harvest, the dry matter weight of the seedlings (stems + leaves + roots) was measured after drying in an oven at 105°C to constant weight (Jacquemin, 2012).

Statistical analysis

The obtained results correspond to the average of 3 repetitions. The experimental data were subjected to unidirectional variance analysis (ANOVA) and the average separations were made by the smallest difference (LSD) at the significance level of *P*<0.05, using the Statgraphics centurion XVI program for Windows.

RESULTS

Pomace compost addition effect on seedling vigour

The seedling vigour results (Fig. 1) show a positive effect of the use of olive pomace compost, which is reflected in a high vigour index compared to the control for the different percentages.

The fenugreek seedlings vigour index is significantly improved with the compost addition for all the used percentages compared to the control.

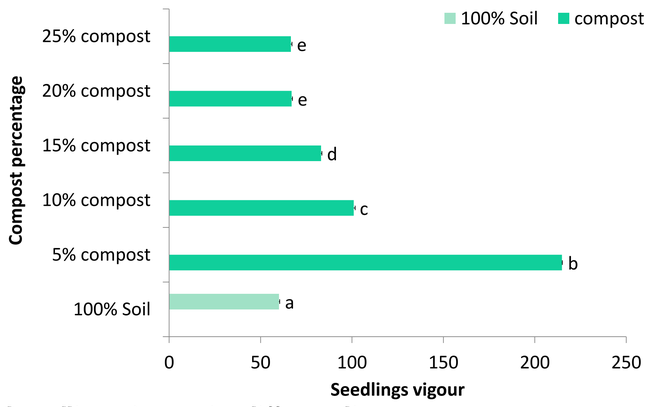

Figure 1. Fenugreek seedlings vigour using different olive-pomace compost concentrations. (Values with different letters are significantly different: p<0.05).

Olive pomace compost addition effect on germination kinetics and final germination rate

The germination kinetics allows us to distinguish three important phases (Fig.2):

- A latency phase, essential for the appearance of the first germs. The duration of this phase is short for the different concentrations (2 days). While it is longer for the control (4 days).
- A more or less linear phase, corresponds to a rapid increase in the germination rate, which evolves proportionally to time (from the 2nd to the 10th day), during this phase an accelerated germination of the seedlings is noticeable for all concentrations.
- A phase that corresponds to the final germination percentage, which is a stage that reflects the germination capacity of the fenugreek seeds for each concentration. This capacity seems important for all compost percentages compared to the control.

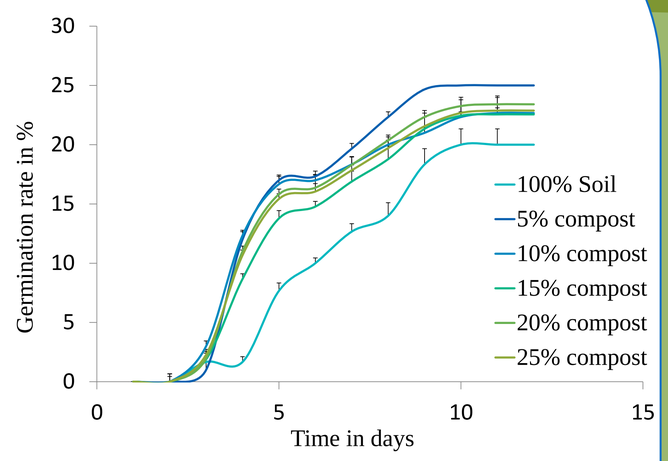

Figure 2. Germination kinetics of Fenugreek seeds using different concentrations of olive pomace compost**.**

In general, all tested seeds germinated at a rate of more than 90% for all compost doses. Indeed, the final germination rate for the different concentrations is significantly different from the control. However, the 5% compost concentration allows an optimal germination rate (100%) (Fig.3).

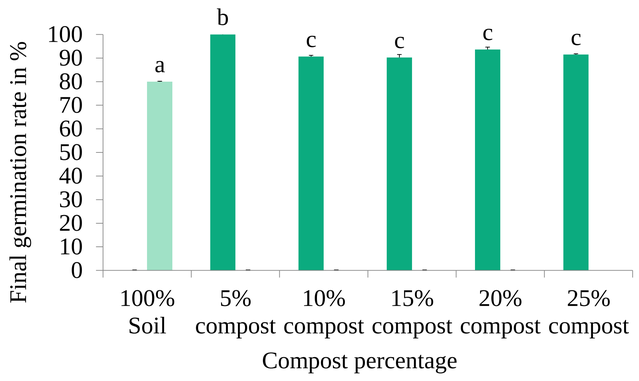

Figure 3. Final Fenugreek seedlings germination rate using different concentrations of olive pomace compost. (Values with different letters are significantly different: p<0.05).

Olive pomace compost addition effect on dry matter weight

The compost addition at different percentages improves the fenugreek seedlings dry matter weight (stems, leaves and roots), compared to the control (Fig. 4). The improvement is notable (p<0.05) for 5%, 10% and 15% compost concentrations.

The increase in the seedlings dry matter weight can be explained by the richness of the compost in macro-elements, namely sodium, calcium, magnesium and potassium, which participate in the formation of plant tissues and represent 99% of their mass (Union of Fertilizer Industries, 1998)

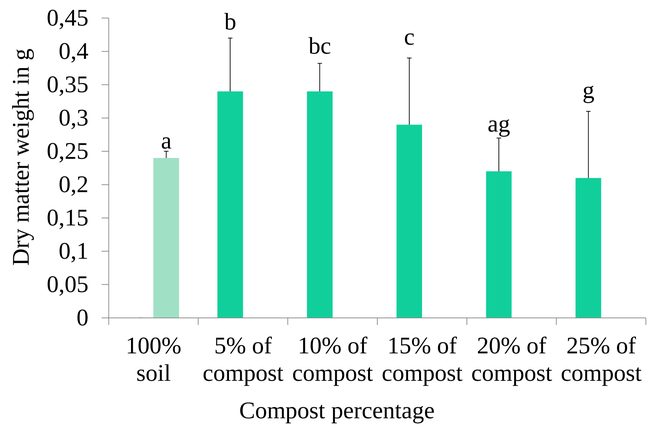

Figure 4. Effects of different percentages of compost on the weight of residual dry matter (Values with different letters are significantly different: p<0.05).

DISCUSSION/CONCLUSIONS

The olive pomace compost use as a soil amendment for the germination of fenugreek gave satisfactory results in terms of germination rate, vigour index, root development and dry matter content, for all compost percentages. Moreover, most conducted experiments on fertilization with olive pomace compost showed no real risk of irreversible soil degradation or toxic effects on crops, except in the case of excessive or irrational doses.

Our results are in agreement with other studies carried out in other countries: in Italy, the amendment of olive trees with 50 t/ha of olive pomace compost for 4 years resulted in an increase in shoot growth, volume and weight of olives (Nasini et al., 2013). Similarly, Alburquerque et al. (2007) reported a similar increase in plant growth due to fertilization with pomace compost (Alburquerque et al., 2007). In an Italian study conducted by Proietti et al. (2015), an increase in vegetative activity and productivity of olive trees was observed after being amended with olive pomace compost for three consecutive years (Proietti et al., 2015).

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