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The Effect of Vermicompost on the Winter Wheat Germination

Short Communication

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Author Details

Margit Olle[1,2*]

[1]*Aru Agricultural Ltd. Vandu tee 17, Estonia*
[2]*NPO Veggies Cultivation, Estonia*

*Corresponding author

Margit Olle, Aru Agricultural Ltd. Vandu tee 17, Hulja, Lääne-Virumaa, 45203, NPO Veggies Cultivation, Kesa 60, Tartu, 50115, Estonia

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Abstract

Vermicompost is rich in macro and micronutrients, vitamins, growth hormones, enzymes such as proteases, amylases, lipases, cellulase, and chitinase, and immobilized microflora. Several crops had shown that vermicompost increases germination process. Aim: The purpose of the investigations was to look the effect of vermicompost on the winter wheat germination. Methods: There were two treatments:

1. A wheat (means a wheat crop in Aru Agricultural Ltd. soil) - control,

2. A wheat + vermicompost 7.9g per pot in the soil. Results: Germination was low in control treatment. Vermicompost in soil increased germination.

Keywords: Germination, Winter Wheat, Vermicompost

Introduction

Wheat is an agriculturally significant grain that played a pivotal role in the development of human civilization around 10,000 years ago, when it was first domesticated. In order to accommodate the rapid population expansion, it is important to augment wheat output by 50% by the year 2050. This growth will mostly rely on enhancing yields, given the intense competition for limited arable land from other industries [1].

Vermicompost, generated by the biological processes of earthworms, contains abundant macro and micro-nutrients, vitamins, growth hormones, and various enzymes including proteases, amylases, lipase, cellulase, and chitinase. It also harbors a diverse population of immobilized microflora [2]. Vermicompost might also increase the rate of germination [3].

The problem: Organic waste disposal has caused increasing environmental and economic problems. Also the high cost of synthetic fertilizers is a problem for farmers. Aims: The purpose of this investigation was to assess the influence of the low cost vermicompost technology (which uses the organic wastes) on the germination process of winter wheat crop production.

Materials and Methods

The pot experiments in the greenhouse were carried out in the summertime at the Räpina School of Horticulture with winter wheat variety Skagen.

There were two treatments:

1. A wheat (means a wheat crop in Aru Agricultural Ltd. soil) - control,
2. A wheat + vermicompost 7.9 g per pot in the soil.

Chemical properties of the soil used in treatments on the sowing and harvesting dates are in table 1

Table 1: Chemical properties of the soil used in treatments on the sowing dates.

	pH(KCl)	P (AL)	K (AL)	Ca (AL)	Mg (AL)		Kjeldahl
		mg/100g	mg/100g	mg/100g	mg/100g	C%	N%
SOIL	7,03	6,4	45,3	4484	48,6	8,67	0,35
SOIL + Vermicompost	7,02	6,9	54,1	4513	49,2	8,46	0,361849

Winter wheat seeds were sown (sowing depth 2cm) on 22 of September 2022 in plastic pots of 9 cm diameter. Pots were filled with soil or soil and vermicompost mixture after the treatments. Each plot consisted of 3 pots and each pot of 10 plants. Experiment had 4 replications. The experiment was repeated at the same time. First experiment had in total 24 pots and second experiment had also in total 24 pots. The total amount of plots in experiments was 48.

The greenhouse got lighting from sodium high pressure lamps and lighting if under 17000 lux at plant level lasted from 06.00 – 22.00. All plants were grown with a minimum day and night temperature of 22oC. All pots were watered according to the need and all pots got equally watered.

On 26.09.22 and 29.09.22 the number of germinated plants was recorded (all plants higher than 0,5cm). Analyses of variance were carried out on the data obtained using programme Excel 2019, comparison of means was calculated by Fisher LSD test. Used signs: *** $p<0.001$; ** $p= 0.001 – 0.01$; * $p= 0.01 – 0.05$; NS not significant, $p>0.05$.

Results and discussion

Germination 4 days after sowing was low in treatment 1 (Control). Vermicompost in soil increased germination 66% compared to control treatment [Figure 1, 2]. There were significant differences among treatments in the germination percentage of winter wheat. Accordingly, Olle (2019) found that vermicompost gives faster rate of seed germination. Similarly, scientist described that vermicompost improves germination [2]. Similar results were gathered by other scientists, finding out that vermicompost influenced positively several plant growth [4].

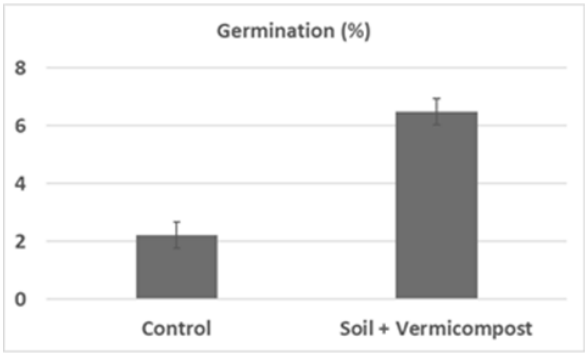

Figure 1: Winter wheat germination (%, ***, LSD 0.91) in experiment.

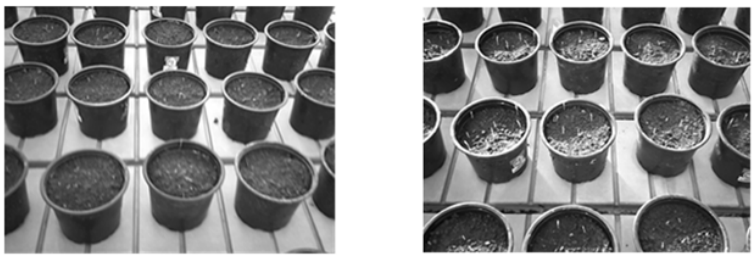

Figure 2: Pictures of winter wheat plants in the experiment according to treatments (left treatment 1, right treatment 2).

On other hand some scientists examined also the effect of vermicompost on rice germination and found that the application of vermicompost had a substantial impact on the time it took for seeds to germinate and the length of the resulting shoots. The application of vermicompost dosages up to 4% resulted in a decrease in germination time, but doses over 4% led to an increase in germination time. However, the application of vermicompost resulted in a reduction in shoot elongation by up to 4%, but higher dosages of vermicompost enhanced shoot elongation compared to the plots that were not treated. The vermicompost treatments did not have a significant influence on the other evaluated metrics [5].

Conclusions

Vermicompost in soil increased germination 66% compared to control treatment. There were significant differences among treatments in the germination percentage of winter wheat.

Acknowledgements

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