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BIOCONVERSION OF MOSSES INTO COMPOST: ITS EFFECT TO PLANT GROWTH

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ABSTRACT

This research focused on "Bioconversion of Mosses into Compost: Its Effect to Plant Growth" aimed to determine it aimed to know the level of acceptability of the compost in terms of physical test as to Appearance, Odor and Consistency/Texture and the level of plant growth in terms of rate (height), plant color as well as its length. The descriptive method of research was used in this study to gather the necessary data and information on to determine the level of acceptability of Bioconversion of Mosses into Compost. Furthermore, to determine level and its effect to plant growth, experimental method of research will be employing by the researcher. The goal of the researchers is to know the level of moss compost in terms of appearance, odor, consistency/texture, nitrogen content effectivity on the plant growth in terms of Rate of plant growth (height); Plant color (flower); and Length of green pod (Okra). The purpose of this study was to examine the acceptability of moss compost in terms of appearance, odor and consistency/texture. The use of moss compost effect on plant growth. The information obtained by completing this study will beneficial to the school and farmers. The results demonstrated that moss compost was highly acceptable and theirs is an effect on the plant growth. The Gulayan sa Paaralan and farmers are the recipients of this study.

INDEX TERMS—*Bioconverson, compost, plant growth*

1 INTRODUCTION

Waste materials remains a major challenge in the Philippines especially in Urban areas. China and Indonesia, the Philippines ranks as the world's third biggest polluter. Crispian Lao, head of the Philippine Alliance for Recycling and Materials Sustainability (PARMS) said 70 per cent of the Filipino population has no access to disposal facilities and sanitary landfills, causing waste to leak into the oceans. The waste generated from various sources causes health problems and serious environmental problems. One solution given by the government is the Republic Act No. 9003 also known as the "Ecological Solid Waste Management Act of 2000, enacted on January 26, 2001". In this research waste materials are used to produce compost, moss a main material (Fernandez 2020).

Climate change has rapidly broadened over the past decades resulting to creation of greater projects that involves not only preservation of air, soil, and water quality and of genetic resources but also improvement of the human environment in its widest sense. Because of this, environmental problems that are causing long-term damage to the earth's ecosystem have become the priority of most researchers and scientists.

Bio conversion also known as biotransformation, is one of the solutions that may be small today but will greatly impact the world for the next decades, if proven and implemented. It is defined as the conversion of waste material or organic material to produce usable products by using fermentation process. With climate change as one of the top environmental concerns, bioconversion process can contribute as a campaign for environmental awareness and can be an environmentally friendly alternative to common chemical processes. Bioconversion experimentations is already known for a while now ranging from different plants, organisms and substances. In this research, mosses will be bio transformed (Morales, Cledera and Revuelta 2021).

Mosses are small flowerless plant that came from the division of Bryophyta and considered as non-vascular plants. They can be found in swam and shady places. They are best known for those species that carpet woodland and forest floors, which helps prevent soil erosion (Struber 2013).

In line with the discussion above, bioprocesses such as bioconversion represent a promising and environmentally friendly option to replace the well-established chemical processes used nowadays for the production of chemicals fuels and other commercial products.

As broadly known that bioconversion is use in renewable resource, it is not yet used producing compost. In order to present comprehensive research, the researcher will attempt integrate different finding from some researches.

The purpose of this study is to present the process of bioconversion of organic matter using mosses as compost with the available resources and evidence based on literature. For these reasons, the researcher will convert mosses into a more useful and profitable product and find out its significant effect to plant growth.

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It is hope in this study that it can be used in farming and other fields related to agriculture.

2 OBJECTIVES

The aim of this project is to know the level of bioconversion of mosses into compost: its effect to plant growth. Specifically, this research aims to know the level of acceptability of the compost in terms of physical test as to Appearance, Odor and Consistency/Texture and the level of plant growth in terms of rate (height), plant color as well as its length.

3. METHODOLOGY

The descriptive method will be use to determine the level of acceptability of Bioconversion of Mosses into Compost.

Steven (2016) defines descriptive method in research is to develop, test and evaluate research instruments and methods. It explores phenomena in real life situations and uses a survey method. Common data gathering methods are questionnaire, interview and observation.

Furthermore, to determine its effect to plant growth, experimental method of research will be employing by the researcher. The researcher strongly believes that it is the appropriate designs to be used since the researcher actively influences the independent to observe the consequences of this study.

4. LITERATURE REVIEW

The use of organic matter such as animal manures, human waste, food wastes, yard wastes, sewage sludges and composts has long been recognized in agriculture as beneficial for plant growth and yield and the maintenance of soil fertility. The new approaches to the use of organic amendments in farming have proven to be effective means of improving soil structure, enhancing soil fertility and increasing crop yields.

Compost are products derived from the accelerated biological degradation of organic wastes by earthworms and microorganisms. Earthworms consume and fragment the organic wastes into finer particles by passing them through a grinding gizzard and derive their nourishment from microorganisms that grow upon them. The process accelerates the rates of decomposition of the organic matter, alter the physical and chemical properties of the material, leading to a humification effect in which the unstable organic matter is fully oxidized and stabilized (Albanell, 2018).

A physical test is a qualitative or quantitative procedure that consists of determination of one or more characteristics of a given product, process or service according to a specified procedure and is often this is part of an experiment (Harris, 2018). Physical testing is common in physics, engineering, and quality assurance. Some physical testing is performance testing which covers a wide range of engineering or functional evaluations where a material, product, or system is not specified by detailed material or component specifications. Rather, emphasis is on the final measurable performance characteristics and testing can be a qualitative or quantitative procedure.

The American Society for Testing and Materials (ASTM) as well as the International Commission on Illumination (CIE) also define appearance as the aspect of visual experience by which objects are recognized (Hubbard, 2019). The ASTM specifies, furthermore, the definition of appearance from a psychophysical point of view: "perception in which the spectral and geometric aspects of a visual stimulus are integrated with its illuminating and viewing environment." The physical properties have, of course, influence on the way things look, but also the neurophysiology and psychology of vision play a very important role in determining how objects and the world appear to humans (Saunders, 2019). Thus, it is important to understand visual appearance not merely in regard to physical aspects but as a sensation produced by the visual system when processing stimuli channeled by means of light – visible radiation.

Moreover, visual appearance, understood as a visual sensation, i.e., what humans see, has certain attributes, which are also visual sensations it means that visual presentation can affect the choice of people examining a product. These include color, visual texture, gloss, and transparency. In the ASTM definition the "spectral aspects" refer, of course, to color, and the remaining aspects (including the perceived shape, size, etc. of objects) are usually considered as "geometric aspects." From these visual sensations' observers get information about the environment and build their knowledge of the external world, which allows them to interact with the environment and other individuals (Caivano & Green-Armytage, 2018).

Odor is further used as a variable in moss compost. The odor or scent can give clues to the condition of the compost. Through the odor of compost it can distinguish if the study is failed or not.

Moss compost can be decode through the psychological dimensions of human odor perception. Odor scientists as well as fragrance professionals have tried to establish comprehensive standards for the description, measurement, and prediction of odor quality characteristics (Bax, Sironi, & Capelli, 2020). As odor percepts could not be linked to a few measurable physicochemical features of odorous compounds or physiological characteristics of the olfactory system, odor qualities have often been assessed by perception-based ratings (Kaeppler & Mueller, 2019).

Consistency or texture of most compost is also perceived as a variable important for this study. Texture refers to the qualities of the product that can be felt by the fingers.

The natural world is rich in texture: the surface of any visible object is textured at certain scale. A wealth of textures is observed on both artificial and natural objects such as those on wood, plants, materials and skin. In a general sense, the word texture refers to surface characteristics and appearance of an object given by the size, shape, density, arrangement, proportion of its elementary parts. A texture is usually described as smooth or rough, soft or hard, coarse of fine, matt or glossy, and etc. (Allen, 2020).

Standard test is also known as elemental analysis, composition analysis can be qualitative (determining what elements are present), and quantitative (determining how much of each are present). Depending on the material being tested, a method called spectroscopy is often used to determine the chemical composition of the sample and to identify any impurities that could affect the quality of the material.

One of the main aims of chemical testing is to check the quality of materials by identifying what they are made of, and whether they contain anything that shouldn't be there according to relevant standards, requirements, or regulations (Ruell, 2017). To achieve this, you'll need a chemical testing laboratory.

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Plants make an amazing variety of pigment molecules, far more than animals. After all, plants are creatures of light. They sense light to control their growth and rapid responses to the environment, and they use light as their source of energy. Plants produce pigments to advertise rewards for animals which pollinate flowers and disperse seeds. Thus, pigments may have physiological and/or biological functions (Shepard, 2018).

There are three types of pigments present in the leaves of plants, and their retention or production determines the colors of leaves before they fall from, molecules, beyond the simple chemical formulas that describe the numbers of atoms of different elements making up the molecule. The example shown here is the common sugar glucose. Glucose can be purchased as a sweetener, most commonly is one half of the common table sugar (sucrose), which is a disaccharide (May, 2017). More complicated diagrams will be displayed to illustrate the structures of the three types of pigments that are present during the aging of leaves; chlorophylls, carotenoids, and anthocyanins.

Length is used for identifying the size of an object. Length is a measure of how long an object. Plants have different sizes that can be identify by its length. Marketable plant has a correlation with plant height, fruit length, fruit width, fruit weight, total number of fruits per plant, number of marketable fruits per plant and total yield per plant and had significant negative correlation with number of branches per plant, internodal length, days to 50% flowering, first flowering node and first fruiting node (Adiger S. 2011). By determining the size of the green pod it is measure by the length of the plant.

5. DISCUSSION

Table 1. Level of acceptability of the compost in terms of physical test as to Appearance

Statements	**Farmers**		**EPP Teachers**	
	M	**SD**	**M**	**SD**
Compost made out of mosses perceives a rich, dark brown and crumbly appearance.	5.00	0.00	4.73	0.46
Insects and Nematodes are not visible to the compost.	5.00	0.00	4.73	0.46
The compost looks pleasing to the eye.	5.00	0.00	4.60	0.63
The original organic materials that were put in the compost are no longer recognizable for what they were.	4.80	0.41	4.73	0.46
Small or big particles in compost that perceives any other color than dark brown, were unrecognizable.	4.87	0.35	4.67	0.62
Weighted Mean: SD	4.93	0.26	4.69	0.48
Verbal Interpretation	HighlyAcceptable		HighlyAcceptable	

The (WM= 4.93, SD= 0.23) and (WM= 4.69, SD= 0.48) indicate a very high level of acceptability of moss compost showed that both set of respondents is strongly agreed that the compost in terms of physical test as to Appearance is *Highly Acceptable.* Appearance has been recognized as an opportunity for differential advantage in the marketplace. The appearance of a product influences consumer product choice in several ways (Cole, 2017). Appearance of the moss compost passed the standard appearance of compost which is crumbly any other color than dark brown were not recognizable.

Table 2. Level of acceptability of the compost in terms of physical test as to Odor

	Farmers		**EPP Teachers**	
Statements	**M**	**SD**	**M**	**SD**
Compost does not smell like Ammonia.	5.00	0.00	4.80	0.41
Compost does not smell sour, as it means that the curing is still not finished.	5.00	0.00	4.73	0.46
Having a musty odor of which means that the compost is too moist, is unrecognizable.	5.00	0.00	4.67	0.49
Compost has an earthy odor that is instantly evident upon exposure to the product.	5.00	0.00	4.80	0.41
Odor of the compost is similar to an ordinary compost.	5.00	0.00	4.67	0.49
Weighted Mean: SD	5.00	0.00	4.73	0.46
Verbal Interpretation	Highly Acceptable		Highly Acceptable	

The farmers evaluation on the odor of moss compost got a (WM= 5.00, SD= 0.00) and the TLE teachers (WM= 4.73, SD= 0.46) indicated there is a bit of difference between the farmer and TLE teachers in terms of odor because the TLE Teachers is more sensitive to the odor while the farmers are not sensitive to the odor because every day they are exposed to agricultural materials but both set of respondents is strongly agreed that the compost in terms of physical test as to odor is *Highly Acceptable*. Decoding the psychological dimensions of human odor perception has long been a central issue of olfactory research. Odor scientists as well as fragrance professionals have tried to establish comprehensive standards for the description, measurement, and prediction of odor quality characteristics (Bax, Sironi, & Capelli, 2020).

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Table 3. Level of acceptability of the compost in terms of physical test as to Consistency/texture

	Farmers		EPP Teachers	
Statements	**M**	**SD**	**M**	**SD**
Compost made out of mosses, is not sticky or greasy.	4.87	0.35	4.80	0.41
Compost made out of mosses, is fine and crumbly in a consistent manner.	4.93	0.26	4.73	0.46
When touched, there are no big particles felt while the compost was being investigated.	5.00	0.00	4.67	0.49
Consistency of the compost made out of mosses is way better than other compost.	5.00	0.00	4.73	0.46
The texture of a compost is acceptable as to standard texture of composts.	5.00	0.00	4.73	0.46
Weighted Mean: SD	4.96	0.26	4.73	0.46
Verbal Interpretation	Highly Acceptable		Highly Acceptable	

The (WM= 4.96, SD= 0.26) and (WM= 4.73, SD= 0.468) indicate a very high level of acceptability of moss compost showed that both set of respondents is strongly agreed that the compost in terms of physical test as to Consistency/texture is *Highly Acceptable*. Haralick (2019) considers a texture as an ‘’organized area phenomenon" which can be decomposed into `primitives' having specific spatial distributions. Textures also exhibit local non-homogeneity, i.e. departures from strict homogeneity to some extent in a local image region.

Table 4. Level of acceptability of the compost in terms of standard test report as to Nitrogen

Parameter	Unit	Result	Test Method
Nitrogen$^{\beta}$	*%*	*0.240*	*Kjeldahl*

β – Outsourced to F.A.S.T Laboratories' recognized external provider

Table 4 shows the level of acceptability of the compost in terms of standard test report as to Nitrogen. Using the Kjeldahl test method that consists essentially of transforming all nitrogen in a weighed sample into ammonium sulfate by digestion with sulfuric acid, alkalizing the solution and determining the resulting ammonia by distilling it into a measured volume of standard acid, the excess of which is determined by titration, the *Nitrogen$^{\beta}$* of compost fertilizer has a test results of 0.240% and obtained at time of examination and relate only on the sample tested.

This means that the level of acceptability of the compost in terms of standard test report as to Nitrogen with test results of 0.240% which is less than 1% that is common in organic compost especially in the early stage of composting is acceptable.

Nitrogen is a crucial component of the proteins, nucleic acids, amino acids, enzymes and co-enzymes necessary for cell growth and function. To provide optimal amounts of these two crucial elements, you can use the carbon-to-nitrogen (C/N) ratio for each of your compost ingredients (Davis, 2017).

Table 5. Difference between the assessments made by the groups of respondents on the acceptability of moss compost

Physical Test	Respondents	Mean	t-value	p-value	Analysis
Appearance	*Farmers*	4.93	1.7729	0.0430	*Significant*
	EPP Teachers	4.69			
Odor	*Farmers*	5.00	2.4672	0.0357	*Significant*
	EPP Teachers	4.73			
Consistency/ Texture	*Farmers*	4.96	1.9667	0.0334	*Significant*
	EPP Teachers	4.73			

Table 5 illustrates the difference between the assessments made by the groups of respondents on the acceptability of moss compost. The data were statistically treated using the t-test. The responses of the farmers are paired to the responses of the EPP teachers.

The t-value of physical test for *appearance, odor, and consistency texture* are all greater than the critical t-value and supported with p value (p=0.0430, p=0.0357, p=0.0334), it can infer that there is a difference and the analysis is *Significant.*

Based on the data, it is shown that there is a significant between the assessments made by the groups of respondents on the acceptability of moss compost at 0.05 level of significance. It shows that the null hypothesis stating that “There is no significant difference between the assessments made by the groups of respondents on the acceptability of moss compost” is rejected, it can inferred that there is “significant” difference between them.

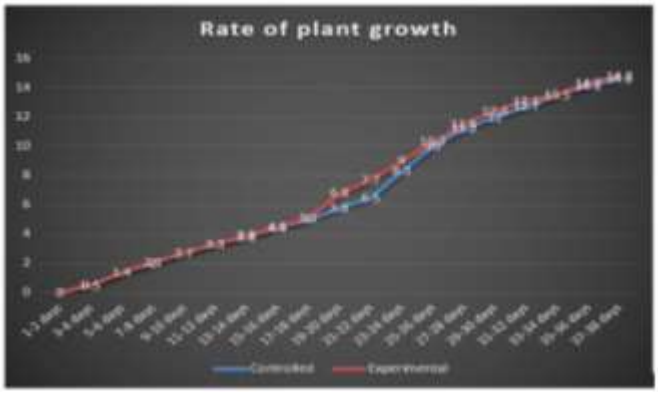

Figure 2. Level of plant growth in terms of Rate of plant growth (height)

Figure 2 shows the documentation of the effectiveness of compost**.** There is no difference in the result of observation from Day 1 to Day 12 of the plant growth in terms of Rate of plant growth (height). Starting from Day 13, there is a 0.1-unit difference between controlled and experimental group. At the end of observation, the controlled group has 14.6-unit measurement and the experimental group has 14.8-unit measurement and there

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is a 0.2-unit difference between the two groups. The level of plant growth in terms of Rate of plant growth (height) is very good having the same type of soil.

Bacteria that decompose soil organic matter are hindered in strong acid soils. This prevents organic matter from breaking down, resulting in an accumulation of organic matter and the tie up of nutrients, particularly nitrogen, that are held in the organic matter (Bickelhaupt, 2017).

Table 6. Level of plant growth in terms of Plant color (flower)

Days	Controlled	Experimental	Remarks
1-2 days	n/a	n/a	*n/a*
3-4 days	yellow green	yellow green	*No difference*
5-6 days	green	green	*No difference*
7-8 days	green	green	*No difference*
9-10 days	green	green	*No difference*
11-12 days	green	green	*No difference*
13-14 days	green	green	*No difference*
15-16 days	green	green	*No difference*
17-18 days	green	green	*No difference*
19-20 days	green	green	*No difference*
21-22 days	green	green	*No difference*
23-24 days	green	green	*No difference*
25-26 days	green	green	*No difference*
27-28 days	green	light green	*No difference*
29-30 days	light green	yellow	*Different*
31-32 days	yellow	green	*No difference*
33-34 days	green	green	*No difference*
35-36 days	green	green	*No difference*
37-38 days	green	green	*No difference*

Table 6 shows the documentation of the effectiveness of compost**.** There is no difference in the result of observation from Day 1 to Day 26 of the plant growth in terms of Plant color (flower). Only on Day 27 to Day 28, there is a color difference between controlled and experimental group. And at the end of observation, there is no difference between the two groups.

The level of plant growth in terms of Plant color (flower) is very good having the same exposure to sunlight.

Plants produce pigments to advertise rewards for animals which pollinate flowers and disperse seeds. Thus, pigments may have physiological and/or biological functions (Shepard, 2018).

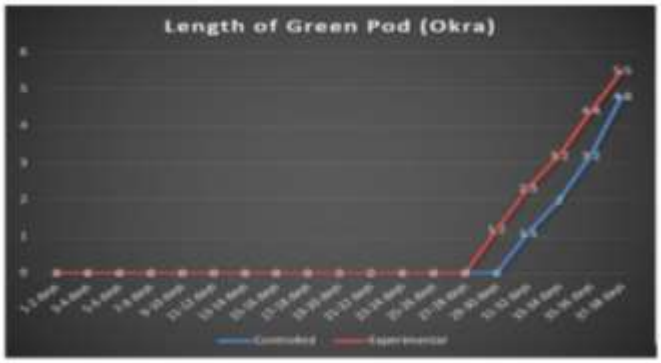

Figure 3. Level of plant growth in terms of Length of green pod (Okra)

Figure 3 shows the documentation of the effectiveness of compost**.** There is no difference in the result of observation from Day 1 to Day 28 of the plant growth in terms of length of green pod (Okra). And on Day 29 the experimental group started to sprout to Day 28, while the controlled group takes 31 days to bud. At the end of observation, the controlled group has 4.8-unit measurement and the experimental group has 5.5-unit measurement and there is a 0.7 unit difference between the two groups.

The level of plant growth in terms of length of green pod (Okra) is very good watered with the same amount of water.

The length of a plant under a compost mixture reacts to its improvement depends on the quantity of organic material available, but it is better to make a shorter heap quickly than a longer heap slowly (Simon, 2019).

6. CONCLUSION

On the basis of the foregoing findings, the following conclusion was drawn. Based on the data, it is shown that there is a significant between the assessments made by the groups of respondents on the acceptability of moss compost at 0.05 level of significance. It shows that the null hypothesis stating that "There is no significant difference between the assessments made by the groups of respondents on the acceptability of moss compost" is rejected, it can inferred that there is "significant" difference between them.

7. RECOMMENDATION

In the light of the conclusions stated, the following recommendations were forwarded. Here are some ways that school can engage parent, school and community to have a strong partnership with the students:

1. It may be recommended that a longer duration with a vast range of samples should be use to further observe the advances of the moss compost. Also, the researchers can find alternatives than can help jump-start the microbes responsible for breaking down organic matter into compost.
2. The nutrients received by the plant with the moss compost should be also take into account. This can further support the researcher's objectives to make an effective moss compost.
3. Finally, feedbacks received should be take into consideration to determine the progress of the researchers in achieving their objectives. Shifting the study's focus to

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interventions that rely on proactive approaches to resolve the issues will be a great follow-up for this study.

REFERENCES

1. *Abanell, Y. (2018). Aqueous extracts of spent mushroom substrate for foliar disease control. Compost Science & Utilization, 2: 67-74.*
2. *Allen, R. (2020). Compost utilization in landscapes. In: Stoffella, P.J. and B.A. Kahn, editors. Compost utilization in horticultural cropping systems. CRC Press LLC. Boca Raton, FL. p. 151-176.*
3. *Bax, C., Sironi, S., & Capelli, L. (2020). How Can Odors Be Measured? An Overview of Methods and Their Applications. Atmosphere, 11(1), 92. https://doi.org/10.3390/atmos11010092*
4. *Bickelhaupt, D. (2017). Soil pH: What it Means. Retrieved March 16, 2021, from www.esf.edu website: https://www.esf.edu/pubprog/brochure/soilph/soilph.htm#:~:text=pH%20Affects%20Nutrients%2C%20Minerals%20and*
5. *Caivano, J. L., & Green-Armytage, P. (2018). Appearance. Encyclopedia of Color Science and Technology, 1–9. https://doi.org/10.1007/978-3-642-27851-8_225-1*
6. *Cole, T.G, (2017). Review Compost: A study of the development process and end-product potential for suppression of turfgrass disease. World Journal of Microbiology & Biotechnology. 16:115-134.*
7. *Davis, F. (2017, February 23). 7 Secrets to Perfect Compost. Retrieved March 16, 2021, from Modern Farmer website: https://modernfarmer.com/2017/02/how-to-compost/*
8. *Fernandez, H.A (2020). https://www.eco-business.com/news/why-plastic-clogged-philippines-must-face-up-to-dearth-of-waste-disposal-and-recycling/*
9. *Haralick, A. (2019). Suppression of bacterial spot of tomato with foliar sprays of compost extracts under greenhouse and field conditions. Plant Dis., 87:913-919.*
10. *Harris and J.H. Andrews. (2018). Putative mechanism and dynamics of inhibition of the apple scab pathogen Venturia inaequalis by compost extracts. Soil Biol. Biochem., 28(9): 1241-1249.*
11. *Kaeppler, K., & Mueller, F. (2019). Odor Classification: A Review of Factors Influencing Perception-Based Odor Arrangements. Chemical Senses, 38(3), 189–209. https://doi.org/10.1093/chemse/bjs141*
12. *May, A. (2017). Effect of organic amendment on amount and chemical characteristics of humic acids in upland field soils. European Journal of Soil Science 59, 1027-1037.*
13. *Ruell, H. (2017). Development of a Sensitive and Rapid Method for the Measurement of Total Microbial Activity Using Fluorescein Diacetate (FDA) in a range of soil. Soil Biol. Biochem. 33: 943-951.*
14. *Shepard, A., D,. (2018). Effects of soil type, management type and soil amendments on the survival of the potato brown rot bacterium Ralstonia solanacearum. Applied Soil Ecology 43, 206-215.*
15. *Shepard, A., D,. (2018). Effects of soil type, management type and soil amendments on the survival of the potato brown rot bacterium Ralstonia solanacearum. Applied Soil Ecology 43, 206-215.*