Plant
2017; 5(6): 85-92
http://www.sciencepublishinggroup.com/j/plant
doi: 10.11648/j.plant.20170506.11
ISSN: 2331-0669 (Print); ISSN: 2331-0677 (Online)

Effect of Aerated and Non-aerated Compost Steepages on the Severity and Incidence of Major Fungal Diseases of Faba Bean; *Botrytis fabae*, *Uromyces vicia fabae* and *Ascochyta fabae*

Addisu Tegegn

Food Microbiology Research Case Team, Food Science Research Directorate, Oromia Agricultural Research Institute, Addis Ababa, Ethiopia

Email address:
addisutegegn16@gmail.com

To cite this article:
Addisu Tegegn. Effect of Aerated and Non-aerated Compost Steepages on the Severity and Incidence of Major Fungal Diseases of Faba Bean; *Botrytis fabae*, *Uromyces vicia fabae* and *Ascochyta fabae*. *Plant*. Vol. 5, No. 6, 2017, pp. 85-92. doi: 10.11648/j.plant.20170506.11

Received: August 18, 2017; **Accepted**: September 5, 2017; **Published**: November 20, 2017

Abstract: Faba bean is attacked by a number of fungal diseases, among which Chocolate spot (*Botrytis fabae*, Ascochyta blight (*Ascochyta fabae*) and rust (*Uromyces vicia faba*) are the major ones. Chocolate spot and rust are the major diseases which can reduce yield by about 61 and 21%, respectively. The use of effective synthetic fungicides is one the control options frequently practiced in Ethiopia. Environmental hazard and economic unfeasibility of this option makes the search for environmentally safe, economically affordable and easily available control measures inevitable. This trial is planned to investigate the efficacy of cow and horse dung compost teas against the in vivo growth of Chocolate spot (*Botrytis fabae*, Ascochyta blight (*Ascochyta fabae*) and rust (*Uromyces vicia faba*). The result showed that B. fabae reduced to less than 22% severity by application of aerated cow and horse dung compost teas. It was also possible to lower the severity of A. fabae to 18.5% from treatment of aerated cow and aerated anon aerated horse dung compost teas. Moreover, with the use of aerated cow dung compost extract rust could be minimized to about 22.2% severity. From this experiment, it has become clear that compost teas of the two sources are effective against severity of the three diseases. It is important that thorough investigation is required on the practicality of the compost teas to fully exploit their potential.

Keywords: Aerated, Non Aerated, Compost Steepage, *Botrytis fabae*, *Uromyces vicia fabae*, *Ascochyta fabae*

1. Introduction

According to Central Statistical Agency [4], faba bean ranked first in production (33.6%) among pulse crops in Oromia Region, Ethiopia and in Bale Zone, the crop took first place in area coverage and production [4]. Faba bean is a valuable source of cheap protein (20 – 25%) especially for the poor who cannot afford animal protein [23; 25]. Additionally, the crop is known for its potential in improving the soil fertility through biological N fixation [24; 25]. Fungal diseases are among the major biotic threats that lower the yield of the crop [27]. Chocolate spot (*Botrytis fabae*), rust (*Uromyces vicia faba*) and Ascochyta blight (*Ascochyta fabae*) are the most frequently prevailing fungal diseases of faba bean which can cause considerable loss of yield. According to Dereje and Beniwal [5], Chocolate spot reduces yield by up to 61% with still the presence of the probability of complete crop failure due to the disease. Dereje and Tesfaye, [6] reported that rust can incur a maximum yield loss of up to 21%. So far, the control of these diseases had been attempted through the use of improved cultivars, cultural practices, chemical fungicides and integration of two or more of the above options in Integrated Disease Management (IDM) scheme. Particularly, Addisu *et al*., [1] *in vitro* and *in vivo* growth of chocolate spot could be sufficiently inhibited by the use of crude extracts of leaves of *Eucalyptus globulus.* Frequent use of synthetic chemical fungicides obviously pose hazards of toxicity and overall pollution on the ecosystem [13]. It leads to the accumulation of harmful chemicals in the soil, water and grains. Moreover it has recently been reported that *B. fabae* and *B. cinerea* have exhibited resistance to those synthetic chemicals [17; 21] due to dependence as the only measure for control. This makes the search for new safer alternatives obligatory for the control of these diseases.

Compost steepages are recorded to be used as sources of beneficial microorganisms potential in the control of fungal plant diseases in foliar and soil application [26]. Equivalent level of efficacy to conventional fungicides has been recorded in several reported research findings [14; 28]. Compost seed dips, plant and soil application have been demonstrated in organic farming literatures from as early as 1924 [15] for use in the biological control of leaf and plant root pathogens. Different research findings have confirmed that the microorganisms in the compost tea are effective in suppressing the growth of the plant pathogenic life by antibiosis, competition, mycoparasitism, cell wall degradation enzymes and induced systemic resistance.

The current trial was setup to investigate the potential of the compost teas from different sources and preparation methods in controlling the field severity of Chocolate spot, Ascochyta blight and rust of faba bean.

2. Materials and Methods

The experiment was conducted at Sinana Agricultural Research Center (SARC) of Oromia Agricultural Research Institute (OARI), Ethiopia, on station for two consecutive years (2014/15 to 2015/16) during main cropping seasons (August – January). The area is conducive for the epidemic development of diseases under investigation. Thus the plants were subjected to natural infestation.

2.1. Compost and Steepage Preparation

Compost was prepared from two sources separately: cow and horse dung, in pits dug with a dimension of 2m width, 2m length and 1m height. Piling and stacking of composting materials were done employing standard procedures of compost preparation.

Aerated compost tea (ACT) was prepared for the two types of composts (cow and horse dung) in a bucket by mixing the compost with tap water at a proportion of 0.4 liter compost and 2 liters of tap water (1:5, v/v) [29]. The mixture was manually agitated for continuous air supply for about 7 days. The tea was then filtered using 8 layered cheese cloth. The filtrate was stored at 4°C until field application. The above proportion of water and compost was used in the preparation of non aerated compost tea (NCT) using the modified procedure of Elad and Shtienberg [10] and Tsror and Bieche [16]. The mixture was loosely covered and stored in the dark at 18°C for 14 days. On the 7th and 14th days of incubation, the tea was manually stirred. After incubation period was over, the mixture was filtered through 8 layers of cheesecloth and conserved at 4°C until application.

2.2. Field Experiment

The trial was conducted at Sinana ARC on-station. A faba bean variety Shallo was used in the experiment. Experimental design was RCB with each treatment being replicated 3 times. Recommended seed and fertilizer rates were made use of representing non experimental variables. Application of the cow and horse dung compost teas (each with ACT and NCT preparations) commenced as soon as the disease appeared and repeated as required using atomizers to sufficient flooding of each plant. A plot receiving an application of only distilled water with equal amount as the teas represented a control. Synthetic chemical (Mancozeb) was inserted for comparison with the compost teas as standard checks.

Disease severity was recorded using 1-9 scale according to Bernier *et al.* [3] and then converted for analysis to Percent Severity Index (PSI) using the following formula developed by Wheeler [30]:

$$\text{PSI} = \frac{\text{Sum of Numerical Ratings}}{\text{Number of Plants Scored X Maximum Score on Scale}}$$

3. Results

Two types of compost, *viz,* cow dung compost and horse dung compost were prepared and teas from each type were extracted and their efficacy tested against the major diseases of faba bean.

Data from 2015/16 experiment were summarized and treatment effect variability was analyzed by conducting ANOVA. Application of compost teas/steepages had affected severity of the three diseases and hence showed significant statistical variability ($p \leq 0.05$) (Table 1). The maximum percentage of severity of *B. fabae* (44.44) was recorded on unsprayed plots of both Shallo and Local cultivars (Figure 1 & 2) On the contrary, magnitude of the disease was lowered to about 18.5% on plots sprayed with aerated compost steepage obtained from horse dung on both cultivars (Table 1). Compared to the unsprayed plots, all the test treatments yielded a highly significant level of disease control. In general, there was a significant statistical difference among the treatments in controlling *B. fabae*.

Similarly, maximum score of *A. fabae* (55.6%) was seen to develop on unsprayed plots (Table 1). Whereas plots treated with aerated compost teas of both cow and horse dung were confirmed to have a minimum severity level of 18.5% (Figure 1) on Shallo variety. It was thus revealed that test treatments have managed to significantly lower the disease compared to the unsprayed control with clear variability among them.

In the same way, rust severity was suppressed to about 11.1 and 22.2% due to application of aerated compost tea preparations of both cow and horse dung, respectively on Shallo variety. This is statistically significant control as compared to the unsprayed plots which exhibited the highest rust severity of 37.0% and 35.8% on local and Shallo varieties, respectively.

Among the yield components investigated, number of fertile tillers per plant was affected by application of the test treatments. Unsprayed plots had the lowest number of fertile tillers (1.3) per plant which is significant compared to the Shallo plots treated with aerated horse dung compost teas (2.8). ANOVA revealed that the number of pods and seeds per plant were significantly varying due to the treatments. Plots sprayed with non aerated cow dung compost tea produced the maximum number of pods (18.3) per plant which is significantly higher than that obtained from unsprayed plots (8.2). Whereas aerated cow dung compost tea sprayed Shallo plot scored the maximum number of seeds per pod (3.1) and unsprayed plots kept their consistency in yielding the lower number of seeds per pod (2.4). The lowest number of pods per plant (8.2) was obtained from plots with no application of compost teas on Shallo variety (Table 1). Whereas due to spraying synthetic chemical (Mancozeb 80WP), 14.5 pods were formed per plant. Non aerated cow dung tea sprayed Local cultivar plots had managed to produce 18.3 pods per plant. However, unsprayed plots had formed 8.8 pods per plant. Compost tea treatment had brought about a significant effect on thousand kernel weight and grain yield. The maximum magnitude of TKW (451.6), which is significantly higher than that obtained from unsprayed plots, was produced by plots sprayed with non aerated cow dung compost tea (Table 1). Plots which received aerated cow dung compost tea had given the highest yield of 38.0 quintals ha^{-1} which was revealed to be significantly higher than the yield obtained from the unsprayed plots.

Table 1. *Effect of application of compost steepages on the severity of major diseases of faba bean during 2014/16 – 2015/16 cropping seasons.*

Treatments	Disease severity (PSI)					
	2015/16			2014/15		
	B. fabae	***A. fabae***	***U. vicia faba***	***B. fabae***	***A. fabae***	***U. vicia faba***
A-CDCS	22.2^{cd}±0.0	22.2^{bc}±2.9	22.2^{b}±5.0	51.9^{a}±2.3	50.0^{a}±2.5	42.6^{a}±3.4
NA-CDCS	33.3^{b}±4.1	29.6^{b}±3.7	27.8^{b}±2.5	50.0^{ab}±2.5	50.0^{a}±2.5	42.6^{a}±3.4
A-HDCS	18.5^{d}±2.3	20.4^{c}±1.9	24.1^{b}±1.9	50.0^{ab}±2.5	50.0^{a}±2.5	46.3^{a}±1.9
NA-HDCS	29.6^{bc}±2.3	22.2^{bc}±4.1	25.9^{b}±2.3	42.6^{c}±4.5	44.4^{a}±4.1	37.0^{b}±2.3
SCh	27.8^{bcd}±2.5	24.1^{bc}±1.9	22.5^{b}±0.0	44.4^{bc}±2.9	42.6^{a}±3.4	38.9^{ab}±3.8
Unsprayed	44.4^{a}±5.0	55.6^{a}±5.0	36.4^{a}±2.0	55.6^{a}±0.0	50.0^{a}±2.5	40.7^{ab}±3.7
CV (%)	26.9	24.0	17.9	10.0	16.3	17.3
$LSD_{(p<0.05)}$	9.45	8.32	5.65	6.3	9.1	8.5

Note: PSI=Percent severity index; A-CDCS= aerated cow dung compost steepage; NA-CDCS= Non-aerated cow dung compost steepage; A-HDCS=aerated horse dung compost steepage; NA-HDCS= Non-aerated horse dung compost steepage; SCh=synthetic chemical; CV=coefficient of variability; LSD=least significant variability.

During the cropping season 2014/15 application of non aerated horse dung compost tea created the lowest severity of the three diseases with statistically significant variability except *A. fabae* (Table 1). The lowest severity was 42.6, 44.4 and 37.0% for *B. fabae, A. fabae and U. vicia faba,* respectively, which were obtained due to application of the aforementioned treatment exhibiting significant statistical difference compared to the unsprayed plots. On Shallo variety, the lowest chocolate spot severity was obtained by application of aerated cow and horse dung compost teas. Whereas the minimum severity of ascochyta blight was achieved due to aerate cow and horse dung as well as non aerated cow dung compost teas (Figure 3). Non aerated horse dung compost tea could manage to lower chocolate spot, ascochyta blight and rust severity to about 33.3, 37.0 and 37.0%, respectively on local cultivar (Figure 4).

Number of fertile tillers per plant, number of pods per plant, number of seeds per plant and plant height were significantly different among treatments for both Shallo and the Local cultivar (Table 2). There was no significant difference among thousand kernel weight and grain yield. However, there is a visible figurative variability among treatments in grain yield, especially for the Local cultivar. The maximum mean yield of 3534.0 kg/ha was obtained from plots treated with aerated cow dung compost tea. Whereas, the minimum mean grain yield of 2043.0 kg/ha was from plots which received aerated horse dung compost tea (Table 2).

Table 2. *Interaction effect of variety and compost steepage application on yield and yield components of faba bean during 2015/16 cropping year.*

Variety	Compost steepage	No. of fertile tillers/plant	No. of pods/plant	No. of seeds/pod
Shallo	A-CDCS	2.3^{ab}±0.0	11.6^{bcd}±0.5	3.1^{ab}±0.2
	NA-CDCS	2.3^{ab}±0.2	13.7^{bc}±1.3	2.5^{bc}±0.1
	A-HDCS	2.8^{a}±0.1	12.8^{bc}±0.5	1.9^{cd}±0.2
	NA-HDCS	2.1^{bc}±0.1	13.2^{bc}±0.9	1.8^{c}±0.1
	SCh	2.4^{ab}±0.1	14.5^{b}±0.3	2.0^{c}±0.1
	Unsprayed	1.3^{d}±0.0	8.2^{e}±0.9	2.4^{d}±0.1
Local	A-CDCS	1.7^{cd}±0.3	12.4^{bc}±1.3	2.2^{bc}±0.2

Variety	Compost steepage	No. of fertile tillers/plant	No. of pods/plant	No. of seeds/pod
	NA-CDCS	2.1^{bc}±0.4	18.3^{a}±2.3	2.0^{a}±0.1
	A-HDCS	2.3^{ab}±0.0	13.8^{bc}±0.5	2.3^{abc}±0.2
	NA-HDCS	2.3^{ab}±0.0	12.5^{bc}±0.9	2.3^{abc}±0.2
	SCh	2.3^{ab}±0.0	10.8^{cde}±0.8	2.5^{bcd}±0.1
	Unsprayed	2.4^{ab}±0.1	8.8^{de}±0.3	3.2^{abc}±0.5
	CV (%)	13.6	13.4	14.5
	$LSD_{(p<0.05)}$	0.51	2.9	7.0

Table 2. *Continued.*

Variety	Compost steepage	Days to maturity	Plant height (cm)	Biomass weight (gm)	TKW (gm)	Grain yield (kg/ha)
Shallo	A-CDCS	118.3^{ab}±0.9	98.2^{ab}±2.3	750.0^{bcd}±86.6	425.6^{ab}±28.1	3264.0^{bc}±950.7
	NA-CDCS	119.0^{ab}±2.1	90.8^{bc}±2.0	800.0^{abc}±50.0	451.3^{a}±6.9	3274.7^{bc}±402.5
	A-HDCS	118.7^{ab}±1.7	92.7^{bc}±1.2	650.0^{de}±0.0	390.8^{bc}±24.0	1804.0^{a}±233.6
	NA-HDCS	117.0^{ab}±0.6	94.5^{abc}±2.0	666.7^{cde}±16.7	422.3^{abc}±16.1	2557.0^{abc}±68.6
	SCh	117.3^{ab}±0.7	86.7^{c}±1.3	733.3^{bcd}±44.1	407.0^{abc}±10.9	2070.7^{ab}±366.0
	Unsprayed	118.0^{ab}±1.3	94.0^{abc}±0.2	550.0^{e}±57.7	416.9^{abc}±2.1	2646.3^{abc}±312.2
Local	A-CDCS	117.3^{ab}±0.3	94.0^{abc}±1.9	925.0^{a}±14.4	393.2^{bc}±9.0	3821.7^{c}±185.8
	NA-CDCS	118.3^{ab}±0.9	94.3^{abc}±1.0	833.3^{ab}±60.1	396.9^{bc}±19.0	3257.7^{bc}±261.8
	A-HDCS	117.0^{ab}±0.6	93.3^{bc}±0.2	625.0^{de}±14.4	388.5^{bc}±15.5	2537.3^{abc}±507.5
	NA-HDCS	120.0^{a}±1.2	102.0^{a}±6.0	725.0^{bcd}±14.4	376.1^{c}±15.4	2732.0 ^{abc}±830.1
	SCh	116.0^{b}±0.6	95.2^{ab}±0.7	925.0^{a}±43.3	379.1^{bc}±1.9	3401.3^{bc}±310.4
	Unsprayed	117.0^{ab}±0.6	98.1^{ab}±2.3	833.3^{ab}±44.1	412.7^{abc}±12.0	3370.0^{bc}±111.0
	CV (%)	1.4	4.5	10.2	6.7	7.4
	$LSD_{(p<0.05)}$	2.8	7.2	91.5	32.1	157.0

Note: PSI=Percent severity index; A-CDCS= aerated cow dung compost steepage; NA-CDCS= Non-aerated cow dung compost steepage; A-HDCS=aerated horse dung compost steepage; NA-HDCS= Non-aerated horse dung compost steepage; SCh=synthetic chemical; CV=coefficient of variability; LSD=least significant variability.

Table 3. *Interaction effect of variety and compost steepage application on yield and yield components of faba bean during 2014/15 cropping year.*

Variety	Compost steepage	No. of fertile tillers/plant	No. of pods/plant	No. of seeds/pod	Days to maturity	Plant height (cm)	Biomass weight (gm)	TKW (gm)	Grain yield (kg/ha)
Shallo	A-CDCS	3.7^{b}±0.0	19.6^{bcd}±0.8	3.1^{ab}±0.2	118.3^{ab}±0.9	100.5^{ab}±1.4	900.0^{b}±180.0	561.0^{ab}±7.8	3209.1 ^{a}±363.6
	NA-CDCS	4.0^{ab}±0.2	23.3^{bc}±2.3	2.5^{bc}±0.1	119.0^{ab}±2.1	90.8^{bc}±2.0	960.0^{ab}±60.0	577.1^{a}±3.9	3384.5^{a}±62.4
	A-HDCS	4.7^{a}±0.2	21.7^{bc}±0.8	1.9^{c}±0.2	118.7^{ab}±1.7	92.7^{bc}±1.9	780.0^{bc}±0.0	580.4^{a}±22.4	3528.7^{a}±240.3
	NA-HDCS	3.6^{bc}±0.2	22.4^{bc}±1.5	1.8^{c}±0.1	117.0^{ab}±0.6	94.5^{bc}±2.0	800.0 ^{bc}±20.0	571.7^{ab}±5.7	3145.3^{a}±268.8
	SCh	4.3^{ab}±0.1	24.7^{b}±0.5	2.0^{c}±0.1	117.3^{ab}±0.7	86.7^{d}±1.3	780.2^{bc}±180.0	551.7^{ab}±26.1	3418.7^{a}±114.5
	Unsprayed	2.3^{d}±0.1	13.9^{e}±1.5	2.4^{bc}±0.1	118.0^{ab}±1.0	94.0^{bcd}±0.2	660.0^{c} ±120.0	554.9^{ab}±11.7	3345.4^{a}±320.1
Local	A-CDCS	2.8^{cd}±0.6	21.2^{bc}±2.3	2.2^{c}±0.2	117.3^{ab}±0.3	94.0^{bcd}±1.9	1153.3^{a}±30.0	527.6^{b}±7.1	3534.0^{a}±31.5
	NA-CDCS	3.6^{bc}±0.7	31.2^{a}±2.3	2.0^{c}±0.1	118.3^{ab}±0.9	94.3^{bcd}±1.0	1000.0^{ab}±72.1	546.3^{ab}±4.4	3375.0^{a}±254.4
	A-HDCS	4.0^{ab}±0.0	23.4^{bc}±0.8	2.3^{c}±0.2	117.0^{ab}±0.6	93.3^{bcd}±0.2	860.0^{bc}±111.4	543.5^{bc}±2.1	2043.0^{a}±114.8
	NA-HDCS	4.0^{ab}±0.0	21.3^{bc}±1.5	2.3^{c}±0.2	120.0^{a}±1.2	102.0^{a}±6.0	870.3^{bc}±30.0	551.3^{ab}±12.6	3618.3^{a}±168.1
	SCh	3.9^{ab}±0.0	18.3^{cde}±1.4	2.5^{bc}±0.1	116.0^{b}±0.6	95.2^{abc}±0.7	1140.0^{a}±90.0	379.1^{bc}±1.9	$3496.1.0^{a}$±87.7
	Unsprayed	4.2^{ab}±0.2	15.0^{de}±0.5	3.2^{a}±0.5	117.0^{ab}±0.6	98.1^{ab}±1.0	1000.0^{ab}±52.9	549.0^{ab}±14.4	3302.5^{a}±227.1
	CV (%)	13.6	13.4	14.5	1.4	4.5	10.2	6.7	7.4
	$LSD_{(p<0.05)}$	0.51	2.9	7.0	2.8	7.2	91.5	32.1	ns

Note: PSI=Percent severity index; A-CDCS= aerated cow dung compost steepage; NA-CDCS= Non-aerated cow dung compost steepage; A-HDCS=aerated horse dung compost steepage; NA-HDCS= Non-aerated horse dung compost steepage; SCh=synthetic chemical; CV=coefficient of variability; LSD=least significant variability.

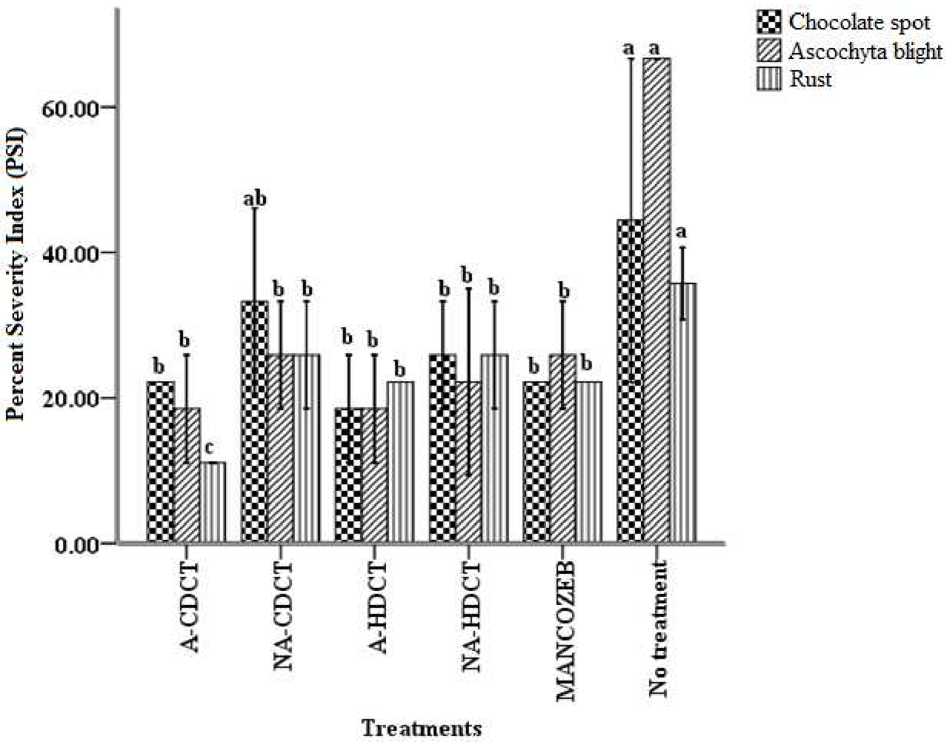

Figure 1. *Effect of variety and compost steepage application on the severity of the major diseases of faba bean during 2015/16 cropping year on Shallo variety.*

Note: A-CDCT=aerated cow dung compost tea; NA-CDCT= non aerated cow dung compost tea; A-HDCT= aerated horse dung compost tea; NA-HDCT, Bars with the same letter are non significantly different.

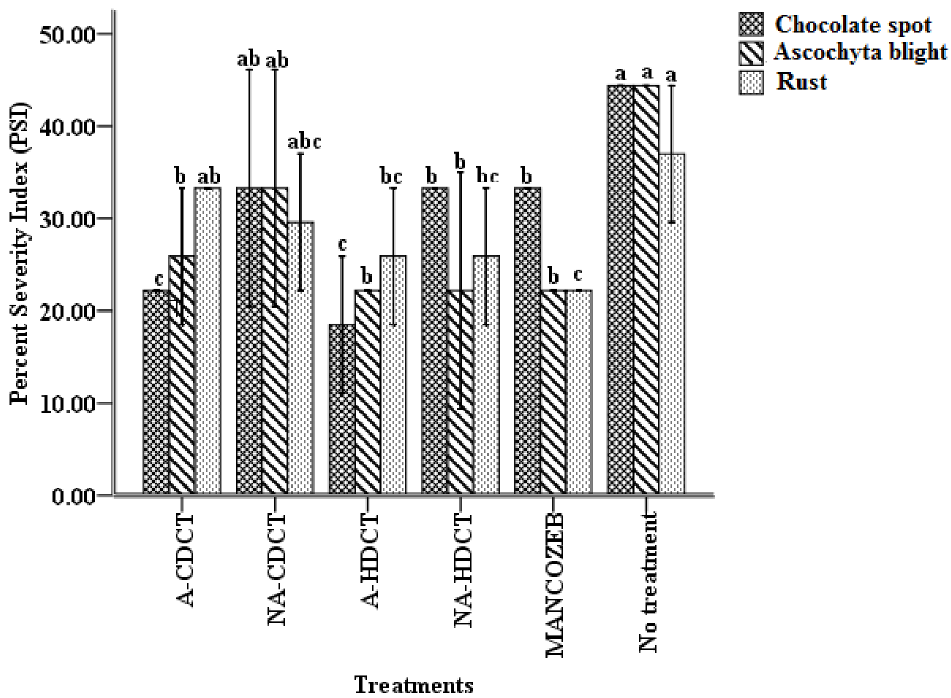

Figure 2. *Effect of variety and compost steepage application on the severity of the major diseases of faba bean during 2015/16 cropping year on Local cultivar.*

Note: A-CDCT=aerated cow dung compost tea; NA-CDCT= non aerated cow dung compost tea; A-HDCT= aerated horse dung compost tea; NA-HDCT, Bars with the same letter are non significantly different.

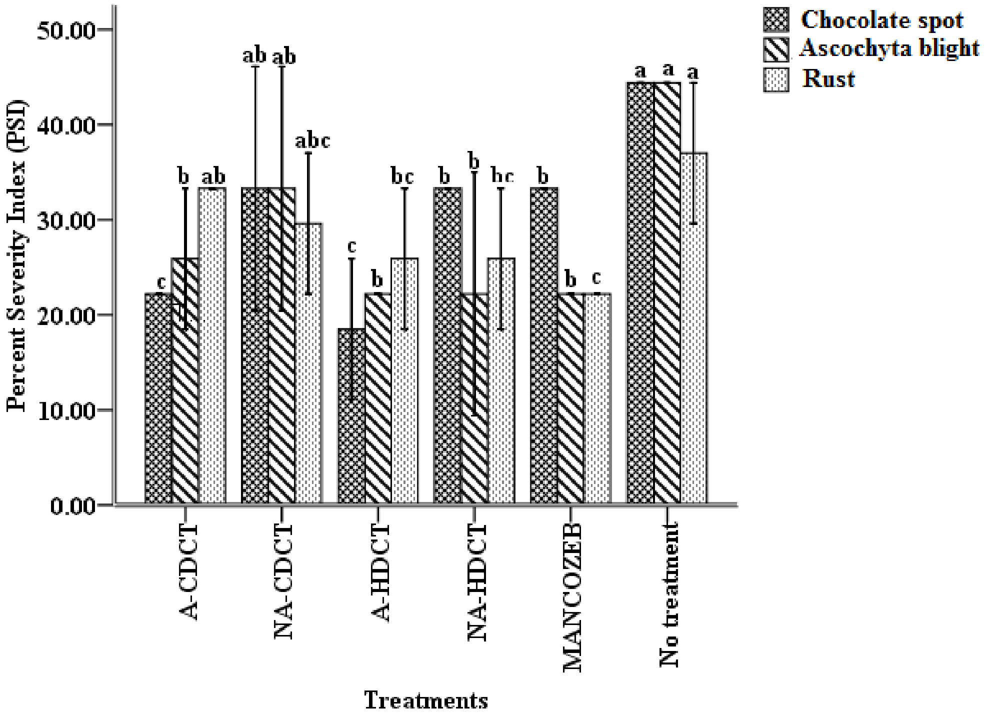

Figure 3. *Effect of variety and compost steepage application on the severity of the major diseases of faba bean during 2014/15 cropping year on Shallo variety.*

Note: A-CDCT=aerated cow dung compost tea; NA-CDCT= non aerated cow dung compost tea; A-HDCT= aerated horse dung compost tea; NA-HDCT, Bars with the same letter are non significantly different.

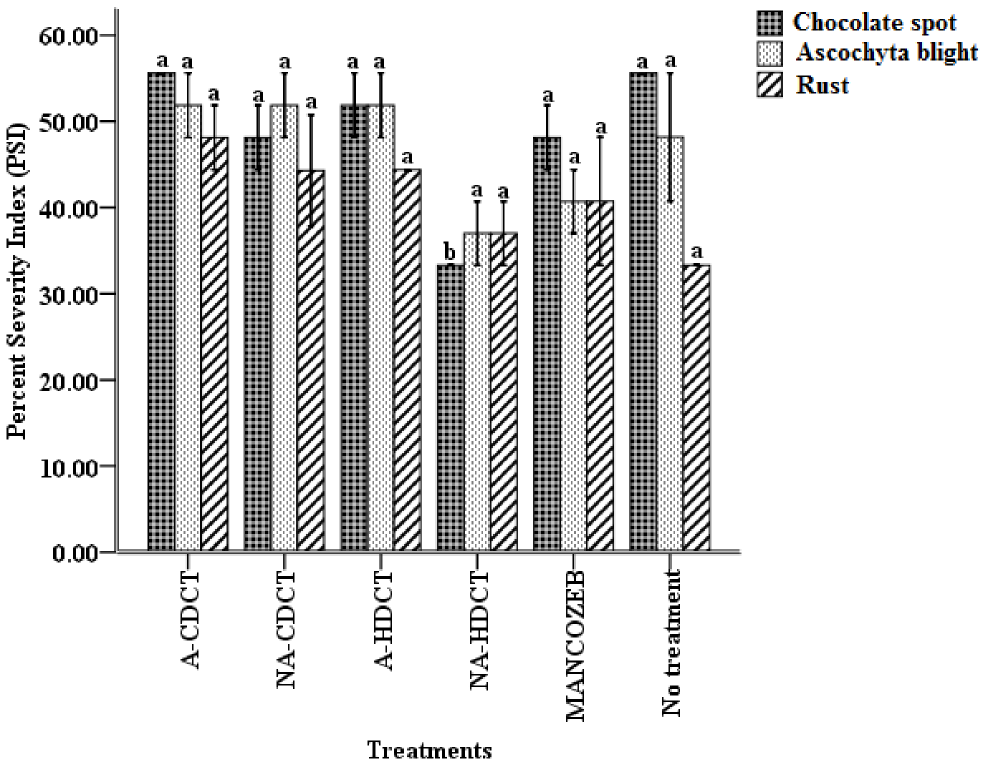

Figure 4. *Effect of variety and compost steepage application on the severity of the major diseases of faba bean during 2014/15 cropping year on Local cultivar.*

Note: A-CDCT=aerated cow dung compost tea; NA-CDCT= non aerated cow dung compost tea; A-HDCT= aerated horse dung compost tea; NA-HDCT, Bars with the same letter are non significantly different.

4. Discussion

Efficacy of compost teas produced from cow and horse dung in aerated and non aerated preparations was tested for their efficacy against *B. fabae, A. fabae* and *U. vicia faba.* The conceptual understanding of the role of biological control agents in inhibiting the *in vitro and in vivo* growth of the plant pathogens is recorded [2]. Application of compost teas from both sources was found to be effective in the suppression of the severity of the three major diseases of faba bean. The efficacy of compost teas prepared from horse and cow dung sources have been reported to have considerable potential in suppressing plant pathogenic fungal diseases [9]. Severity of the three diseases had decreased to as low as 18.5% and 22.2% and 22.2% by application of aerated compost tea prepared from cow dung which were significantly lower than that of the control. Aerated horse dung compost tea has also reduced the severity of 18.5%, 20.4% and 24.1% all being statistically significantly lower than the control. Treatment with compost tea is a biological control approach. According to Pane [20], aerial compost tea application has been proved to be highly suppressive against *Botrytis cinerea, Alternaria alternate* and *Pyrenochaeta lycopersici.* He explained that all the tea treatments have blocked the growth of *B. cinerea.* Suppressive effects of compost teas against several other plant pathogens were reported by Pane *et al.,* [19]. Application of the different compost teas from the different sources was seen to have significantly different potential in controlling the diseases. Reports have shown that compost teas exert an influence on the plant surface through colonizing with actual live bacteria most of them being facultative anaerobes or aerobes in the genera of *Enterobacteria, Serratia, Nitrobacter, Pseudomonads, Bacillus, Staphylococcus* and various *Actinomycetes*. A number of mechanism of action has been reported by several authors. Microbial competition for nutrients [5; 6], antibiotic production [12], antagonistic microbes' natural ability to produce extracellular lytic enzymes [11], parasitism [12] and induction of systemic acquired resistance [31; 22] are among the major means by which compost extracts suppress plant pathogenic microorganisms.

5. Conclusions

From the current trial it was perceived that the extracts obtained from composts of the two types, viz., cow and horse dung in aerated and non aerated preparations each, are effective in suppressing the three major diseases of faba bean. The extract types have been found to be variable in controlling each of the diseases. As the current study is a preliminary investigation, a thorough study into the practical applicability and other issues, *viz.,* application rate, time, preparation age, microbiological analysis and others are vital. Extracts obtained from both cow and horse dung have demonstrated their potential of suppressing all the three diseases to the lowest magnitude. Moreover, *A. fabae* was also satisfactorily controlled by non aerated horse dung compost tea. Therefore, those preparations can be applied in the field after setting up *in vitro* study of the aforementioned important components.

Acknowledgements

I am grateful to the funding Organization, Oromia Agricultural Research Institute, and all the Case Team members for their unreserved support.

References

[1] Addisu, T. T. Meseret, C. E. Bekele, H. E., 2016. Bio-efficacy of Crude Leaf Extracts of *Eucalyptus globulus* Against *In vitro* and *In vivo* Growth of Chocolate Spot (*Botrytis fabae* Sard.) of Faba Bean (*Vicia faba* L.). *Plant*. Vol. 4, No. 5, 2016, pp. 37-44. doi: 10.11648/j.plant.20160405.12.

[2] Asseng, C. C., Ebongo, L. E., Nanda, D. G. L., Akono, N. P., Mbida, J. A., Ngono, N. A., Ambang, Z., Monkam, T. F. and Djouokep, L. G., 2017. Study of Antagonistic Beneficial Microorganisms to *Phytophtora colocasiae*, Causal Agent of Taro Mildew (*Colocasia esculenta* (L.) Schott). *Plant*. Vol. 5, No. 3, pp. 51-60. doi: 10.11648/j.plant.20170503.12.

[3] Bernier, C. C., S. B. Hanounik, M. M. Hussein and H. A. Mohamed, 1993. Field manual of common faba bean diseases in the Nile Valley. International Center for Agricultural Research in the Dry Areas (ICARDA) Information Bulletin No. 3.

[4] Central Statistical Agency (CSA), 2014/15. Report on area and production of major crops. Statistical Bulletin no 578. Addis Ababa, Ethiopia.

[5] Dereje, G. and Beniwal, S. P. S. 1988. Yield losses caused by chocolate spot in faba bean. *Ethiopian Plant Pathology Newsletter* 13: 16-20.

[6] Dereje, G. and Tesfaye, B. 1994a. Faba bean diseases in Ethiopia. Pp 328-345. *In:* Cool Season Food Legumes of Ethiopia (Asfaw Telaye, Geletu Bejiga, Mohan C. Saxena and Mahmoud B. Solh, eds.). Proceedings of the First National Cool season Food Legumes Review Conference, 16-20 December 1993, Addis Ababa, Ethiopia.

[7] Chen, W., Hoitink HAJ, Madden, L. V., 1988a. Microbial activity and biomass in container media for predicting suppressiveness to damping-off caused by *Pythium ultimum. Phytopathology* 78:1447-1450.

[8] Chen, W., Hoitink HAJ, Schmitthenner AF, Tuovinen O. H., 1988b. The role of microbial activity on the suppression of damping-off caused by *Pythium ultimum*. *Phytopathology* 78:314-322.

[9] Dittmer, U. et al., 1990. The influence of compost substrates and compost extracts on various plant diseases, Gesunde Pflanze 42: 219-235.

[10] Elad, Y., Shtienberg, D., 1994. Effect of compost water extracts on grey mould (Botrytis cinerea). Crop Protection 13, 109–114.

[11] El-Masry, M. H., Khalil, A. I., Hassouna., M. S., Ibrahim, HAH, 2002. *In situ* and *in vitro* suppressive effect of agricultural composts and their water extracts on some phytopathogenic fungi. *World Journal of Microbiology and Biotechnology* 18: 551-558.

[12] Hoitink, HAJ, Inbar Y, Boehm, M. J., 1991. Status of compost-amended potting mixes naturally suppressive to soilborne diseases of floricultural crops. *Plant Disease* 75:869-873.

[13] Isman, M. B., 2006. Botanical insecticides, deterrents, and repellents in modern agriculture and an increasingly regulated world. Annu Rev Entomol., 51: 45 – 66.

[14] Ketterer, N. 1990. Untersuchungen zur Wirkung von Kompostextrakten auf den Blattbefall der Kartoffel und Tomate durch *Phytophthora infestans* sowie auf den Befall der Weinrebe durch *Plasmopara viticola*, *Pseudopeziza tracheiphila* und *Uncinula necator*, [Research into the effect of compost extracts on potato and tomato leaf infections through P. infestans as well as the incidences of grape diseases] Doctoral Dissertation, Univ. Bonn.

[15] Koepf, H. H. 1992. Biodynamic Farming: Principles and PracticeAnthro. Press, NY.

[16] L. Tsror, B. J. Bieche, 1999. Biological control of early blight in tomatoes, Acta horti. 487 271-273.

[17] Maggie, E. M. H. Abd El-Rahman, S. El-Abdasi and Mikhail, M. S., 2006. Inducing resistance against faba bean chocolate spot disease. Egypt. J. Phytopathol., 34:69-79.

[18] Lo, C.-T., 1998. General mechanisms of action of microbial biocontrol agents. Pl. Pathol. Bulletin 7: 155-166.

[19] Pane, C., Celano, G., Villecco, D., Zaccardelli, M., 2010. Suppressive effect of aerated 2 compost teas produced in water and in whey on plant fungal pathogens. J. Plant Pathol. 92, S93.

[20] Pane, C., Celano, G., Villecco, D. and Zaccardelli, M., 2012. Control of Botrytis cinerea, Alternaria alternata and Pyrenochaeta lycopersici on tomato with whey compost-tea applications. Crop Protection, 38: 80-86.

[21] Parry, D. W., 1990. Plant Pathology in Agriculture. Cambridge University Press, Cambridge. pp. 181-89.

[22] Pharand, B., Carisse, O., Benhamou., N., 2002. Cytological aspects of compost-mediated induced resistance against Fusarium crown and root rot in tomato. *Phytopathology* 92:424-438.

[23] Rabey, J. M., H. Shabtai, E. Graff and A. D. Korczyn, 1992. Improvement of Parkinsonian features correlate with high plasma levodopa values after broad bean (*Vicia faba*) consumption. J. Neurol. Neurosurg. Psychiat., 55: 725-727.

[24] Samuel, S., S. Ahmed, C. Fininsa, M. M. Abang and P. K. Sakhuja. 2008. Survey of chocolate spot (*Botrytis fabae*) diseases of faba bean (*Vicia faba* L.) and assessment of factors influencing disease epidemics in northern Ethiopia. *Crop Protection,* 27:1457 – 1463.

[25] Schatz, B. and Endres, G., 2009. Field pea production. NDSU Extension services. North Dakota State University, North Dakota.

[26] Scheuerell, S. and W. Mahaffee. 2004. Compost tea as a container medium drench for suppressing seedling damping-off caused by *Pythium ultimum*. Phytopathology.

[27] Tadele Tadesse, Behailu Mulugeta, Gashaw Sefera, Amanuel Tekalign. Genotypes by Environment Interaction of Faba Bean (*Viciafaba L.*) Grain Yield in the Highland of Bale Zone, Southeastern Ethiopia. *Plant.* Vol. 5, No. 1, pp. 13-17. doi: 10.11648/j.plant. 20170501.13.

[28] Tränkner, A. and Urban, J., 1993. Biocontrol of Botrytis cinerea with naturally occurring antagonist populations and their influence of the effectivity and practicability of the use of compost extracts. In: Biological Control of Foliar and Post-harvest Disease. ICBC/WPRS Bulletin.

[29] Weltzien, H. C. 1991. Biocontrol of foliar fungal disease with compost extracts. Pages 430-450 in: Microbial Ecology of Leaves. J. H. Andrews and S. S. Hirano, eds. Springer-Verlag, New York.

[30] Wheeler, B. E. J., 1969. An introduction to plant diseases. WILEY, London, p. 347. 75 Williams, P. F., 1978. Growth of broad beansinfected by *Botrytis fabae*. J. Hort. Sci., 50: 415-424.

[31] Zhang, W., Han, D. Y., Dick, W. A., Davis, K. R., Hoitink HAJ, 1998. Compost and compost water extract-induced systemic acquired resistance in cucumber and *Arabidopsis*. *Phytopathology* 88: 450-455.