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Effect of Fertilization by Fresh or Decomposing Manure and/ or Spraying by New Natural Substance on Turcicum leaf blight (TLB) Disease Incidence, Some Maize Yield Characters and Grains Components

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Maize genotypes reactions against turcicum leaf blight (TLB) caused by *Exserohilum turcicum* showed high disease incidence in case of fertilized by fresh animal manure comparing with which fertilized by decomposing animal manure (5-6 weeks old) and control treatment (no fertilized manure). Moreover, the fertilized by fresh animal manure resulted in increased disease severity and decreased all tested yield characters and also decreased considerable grains components, indicating the complex danger of using fertilized by fresh animal manure. On the other hand, maize hybrids (SC10 and SC 176) were had suitable level of resistance to tested disease comparing with open pollinated variety (balady). The obtained results showed also that, turcicum leaf blight disease was recorded high disease severity, approximately because the climatic conditions were very suitable for development infection by TLB. Moreover, the obtained results also indicated high yield production (kg/2rows), high weight of 100 kernels, high germination %, high length of both of radical and plume cm as well as high length of plants, and high percent of grain components (oil %, carbohydrates%, fiber%, silica , phenols, protein %),all were obtained from plots which were fertilized by decomposing animal manure (5-6 weeks old) comparing with untreated control treatment, while, fertilized by fresh animal manure resulted in lowest values of all characters which mentioned above, with except of ash% and EC which were increased, indicating the considerable of fertilized by decomposing manure. Overall, this study recommended never use of fresh farmyard animal manure in fertilization of the soil. In the same respect, spraying of new natural substance extract which named Frankincense (*Boswellia serrata*) at 3000 ppm on maize plants 10 days after inoculation (45 days from sowing) resulted in decreasing of maize leaf blight disease severity and increasing of yield and their component. While, spraying by fungicide Dithane M45 was slightly high effective in decreasing diseases severity increasing yield and their components, comparing with Frankincense (*Boswellia serrata*) extract.

Keywords: *Exserohilum turcicum, Boswellia serrata,* Frankincense , Animal manure.

1. Introduction

Turcicum leaf blight (TLB) or Northern Corn Leaf Blight (NCLB) is a ubiquitous foliar disease of corn (maize) caused by *Exserohilum turcicum*, (previously it was *Helminthosporium turcicum*). Infection and disease development are favoured by heavy dew, high humidity, and moderate temperatures. Infection by germinating conidia occurs when free water is present on the leaf surface for 6-18 hours and the temperature is between 18-27°C. Lesions loss of photosynthetic tissue can result in decreased yield, and silage quality can be affected, Jakhar et al (2017) and Samavia et al (2017). Badr *et al* (1999) showed that, grain yield of maize were great reduced under artificial infection by turcicum leaf blight especially with susceptible and highly susceptible maize genotypes. The animal manure old was very

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importance and dangerous in plant diseases distribution, here, Neher et al(2013)reported that decomposing farmyard manure have contrasting biochemical structure and resistance to decay. Hardwoods (decomposing farmyard manure) typically have a higher C:N ratio and higher lignin:cellulose ratio than softwoods (fresh manure) and straw, making them more resistant to decay and extending the longevity of the suppressive effect. Vargas-Garcia et al (2010) predicted that decomposing manure containing hardwood bark as a C source would suppress early blight disease and more other soil borne pathogens than manure with fresh or softwood as a C source. Bonanomi et al (2007) added that decomposing organic manure can serve as a biological inoculant for field soils to reduce the severity of root diseases in natural and field systems. Disease suppression from decomposing manure is from heat and activity of oxidative enzymes which effected and may be killed the fungal and oomycota pathogens. In the same item , Neherd et al (2015) designed with two practical objectives for organic farmers. First, demonstrate that decomposing manure, properly made, will heat and kill disease early blight inoculums. Second, conduct a replicated field trial to determine whether decomposing manure would suppress early blight disease on cruciferous crops.

They predicted that old farmyard manure or hardwood bark as a C source would suppress early blight disease more than fresh manure or softwood as a C source. Buyer et al (2010) demonstrate that decomposing manure, properly made, will heat and kill disease early blight inoculum and weed seeds. Proper compost recipe involves a proper C:N, aeration to achieve temperature targets known to kill fungal pathogens. Moreover, Hafiza et al (2016) showed that, decomposing organic farmyard manure stimulate antagonistic activities of microorganisms to soil-borne diseases. The decomposition of organic matter in soil also results in the accumulation of specific compounds that may be antifungal or nematicidal. Pan et al (2019) indicate a possible fungistatic effect from the chicken manure-based organic fertilizer and its potential inclusion in a disease control program to minimize the use of conventional fungicides.

They added that, fresh animal manures increased development of root rot, dieback, and plant death. Handrid *et al* (2020) showed that, the organic material containing some biological agents is the best treatment that is able to suppress severity of Maydis leaf blight with a disease suppression index of 47.36% and increase production by 53.54%. Disease suppression index is positively correlated with corn crop productivity in Ultisol Lands. Overall, Tolba and Soad (2002) found that, colonization of rot fungi in maize grains led to decrease in carbohydrates content which may be due to fungi nutrition and may be also due to stimulated of grains respiration, resulting in loss of viability as manifested by poor germination. Here, Loeckea et al (2004) showed that, corn in the composted manure treatment produced 10% more grain than did corn in the fresh manure treatment. Corn treated with composted manure produced 12% greater above ground than did corn treated with fresh manure, composted manure increased corn crop growth rate (CGR), leaf N concentration, leaf area index (LAI), comparing with fresh manure. Ghorbani et al. (2006) found that Organic manures and composts have been found to have a direct anti disease effect by stimulating competing microorganisms and also by inducing resistance to plant diseases. Wahyuni *et al*. (2016) states that the provision of organic material cow manure can increase the bacterial population from from 10^2 to 10^7 cfu / gram / gram of soil, compared to controls. While, Law-Ogbomo (2017) showed that, the application of animal manures significantly ($P<0.5$) increased plant height, leaf area index, number of leaves, total dry matter, ear length and grain yield over control. Moreover, Gerald (2019) heat generated during the composting process kills most weed seeds and pathogens.

Therefore, composted manure typically is more expensive than fresh or partially aged manure. Moreover, Bradley (2019) showed that, if properly maintained a compost pile will generate its own heat through the microbial action involved in decomposing the compost materials. The temperature should reach between 120- 160 $^{\circ}$f to ensure the killing of pathogens, parasites, and weed seeds, the temperature needs to be at least 131 $^{\circ}$ f for 15 days. Generally, do not apply fresh manure after field is planted. Mbong *et al*. (2020) showed that, Poultry manure treatment significantly reduced the disease incidence and severity of white leaf spot disease and could thus be recommended for the management of white leaf spot disease of fluted pumpkins. On the other hand, Hamidpour et al (2013) showed that, the activity of Frankincense (boswellic acids) has been found to have antimicrobial activities against various microorganisms such as fungi, and gram‐positive and gram‐negative bacterial strains.

Ismail et al (2014) reported that, frankincense has significant antimicrobial activity. In this assay, extracts of frankincense showed antimicrobial activity comparable with standard and can be used in

combating the bacterial infested diseases caused by many bacterial strains. Essam et al (2020) found that, application of compost manure resulted in maximum plant height, ear length, 100- grain weight, grain yield, straw yield, biological yield, grain protein concentration (%) and grain K content (%) of maize varieties.

In this paper studies were conducted on danger of using fresh animal manure on fertilization of maize plants, and also conducted on management of turcicum leaf blight by using one safety natural substance (Frankincense at 300 ppm).

2. Materials and methodes

Preparation of animal's manure

The animals' organic manure was collected by farmer from farm animal barn daily. Then moved and stored in farmyard and left until it is used in the field. Two kind of animal organic manures were used in this study as follows:

The first was fresh animal organic manure (stored for 5-6 days before using), the second was stored animals organic manure (stored for about 5-6 weeks before using).

Preparation of turcicum leaf blight (TLB) inoculum

This is an easiest method to prepare inoculums by collecting heavy infected leaves (by tested disease) collected in the previous year. This should be done before leaves become fully mature. Infected leaves should be stored in large cotton bags in dry condition protected from moisture and rodents. To prepare inoculums, the dry leaves are ground into a meal about the coarseness of wheat bran. Inoculation is done by placing a pinch of leaf meal into whorl of each plant, when plant attains the height of 30-45 cm. This method of inoculation will be ineffective if dry weather prevails following application of the leaf meal. To overcome this situation, 10-12 ml of water can be applied in the whorls by means of sprayer. High humid weather is congenial for inoculation and disease spread. Data can be recorded 30-35 days after inoculation (after about 75-85 days from sowing) on the disease rating scale which reported in table 1, (Badr *et al*., 1999, Shekhar, Kumar 2012 and Alaa *et al*.,2021).

Preparation of Frankincense (*Boswellia serrata*) extract at 3000 ppm

3g from crud Frankincense stones were added to 250 ml distilled water and boiled for dissolving all Frankincense stones, then, distilled water was added and adjusted at 1000 ml from Frankincense extract solution, which resulted in 3000 ppm concentration.

Viability test of seed

Germination test under optimum condition was done according to the international rules (ISTA1993). A germination paper of filter paper strips was folded into 10-50 pleats longitudinally which may be stapled at both end. Seeds were placed in the pleats and sufficient water was added. These strips were either kept in boxes with tight fitting lids or placed directly in a (wet) type cabinet at 29 centigrade. Germination counts for normal seedlings were done after seven days. Cold germination test was measured according to the procedures reported in the seedling vigor testing Hand Book (ISTA 1995).

Electrical conductivity test (EC)

Four sub samples each of 50 seeds were taken from the pure seeds portion of each seed grade. Each sub sample was weighted to the nearest two decimal points after which it was placed in 500 ml conical flask containing 250 ml distilled water. The flasks were covered and then incubated at 25 centigrade for 24 hours period. Conductive measures were recorded at the end of each test period at 20 centigrade using a calibrated conductivity meter (A.O.A.C. 1990).

Chemical composition of grains:

Grains samples were taken at random from each plot and grounded to fine powder to pass through 2mm mesh for chemical analysis, i.e. crude fiber , carbohydrates, silica mg\100g crude protein (N%×5.75) and ash% as well as oil content by the Soxhlet extraction method were determined according to the procedures of the A.O.A.C.(1990) and expressed as a percentage of the dry weight of sample. Total phenols were determined using folin-Denis reagent according to the method of Tolba (1996).

Fungicide:

Dithane M45 (It is based on the active ingredient, mancozeb, which belongs to the dithiocarbamates group of compounds) was used at 250g per 100 little water**.**

Table 1. Modified scale of estimating *Exserohilum turcicum* leaf blight (TLB) infection on maize plants

Rating scale	Infection intensity	Severity of infection (percent of infected leaf area %)	Host response
0	No visible lesions	0.0	
0.5	Very slight infection: one or two restricted lesion on lower leaves	0-5	Highly resistance
1	Slight infection: a few scattered lesion on lower leaves	6-10	Resistant
2	Light infection: moderate number of lesions on lower leaves	11-25	Moderately resistant
3	Moderate infection: abundant lesions on middle leaves	26-50	Moderately susceptible
4	Heavy infection: abundant lesions on lower and up leaves	52-75	Susceptible
5	Very heavy infection: abundant lesions	76-100	Highly susceptible

Field experiment

The experiment was performed at Research farm at the Faculty of Agriculture kafrelsheikh University during 2020 and repeated during 2021 growing seasons. A split split plot design with three replicates was used in this experiment, the main plots were planted by three maize cultivars (SC10, SC176 and balady), while the sub plots were two soil fertilized animal manures: 1- soil fertilized by fresh animal manure (5-6 days old) at rat of 5kg/plot, 2- soil fertilized by decomposing animal manure (stored 5-6 weeks old) at also 5 kg/plot and 3- soil unfertilized by any animal manure (control treatment). The sub sub plots were:

1- inoculated with turcicum leaf blight(TLB) disease and sprayed with Dithane M45, 2- inoculated with turcicum leaf blight(TLB) disease and sprayed with Frankincense, 3- untreated control treatment. The plot size was 24 m2, each plot contained six rows 5m long and 80 cm apart. The plants were thinned to one plant /hill at 25 cm between hills. All agricultural practices were applied in proper time and as recommended. The spraying with the fungicide (Dithane M45 at 2.5 g per one little water) and the new natural substance (Frankincense (*Boswellia serrata*) extract at 3000 ppm) were done after ten days from artificial inoculation (after 45 days from sowing) at each replicate. Samples were taken (500 g of kernels) from control plots in each replicate for further analysis. Estimation of diseases reaction of TLB disease were done after 75-85 days from sowing on the disease rating scale which reported in table 1. At harvest (after 120 days from sowing), the length of plant was estimated, the yield was also estimated as kg/two rows, and the weight of 100 kernels were also estimated for each plot in each replicate.

Results and dissection

Results presented in Table 2 and Figure 1 showed that, the mean severity of turcicum leaf blight (TLB) infection under fresh animal manure treatment was 37.444, while it was 32.667 under stored animal manure treatment.

Table 2. Severity of infection % and three yield characters of three maize cultivars (SC10, SC176 and Balady) were inoculated by turcicum leaf blight (TLB) disease under soil fertilized with fresh and stored animal farmyard manure during 2020 growing season.

Treatments		Severity of infection%	Length of plants(cm)	Weight of 100 kernels (g)	Yield per two rows(kg)
	S.C. 10	9.333c	297.889a	36.000a	10.539a
A	S.C. 176	24.444b	260.444b	33.333b	9.850b
	Balady	71.111a	210.667c	32.000b	7.274c
F test		**	**	*	**
	Fresh animal manure	37.444a	246.000c	31.333b	8.933c
B	Stored animal manure	32.667b	267.556a	36.667a	9.556a
	Untreated	34.778b	255.444b	33.333b	9.144b
F test		**	**	**	**
	S.C. 10× Fresh animal manure	11.333f	281.000c	33.000c	10.067cd
	S.C. 10× Stored animal manure	7.000h	316.333a	39.333a	11.117a
	S.C. 10× Untreated	9.667g	296.333b	35.667b	10.433b
	S.C. 176× Fresh animal manure	28.333c	256.333d	30.333d	9.633e
A×B	S.C. 176× Stored animal manure	21.000e	265.667d	36.333b	10.083c
	S.C. 176× Untreated	24.000d	259.333d	33.333c	9.833de
	Balady× Fresh animal manure	72.667a	200.667f	30.667d	7.100g
	Balady× Stored animal manure	60.000b	220.667e	34.333bc	7.467f
	Balady× Untreated	70.667a	210.667ef	31.000d	7.167g
F test		**	**	**	**

The infection by the disease under fresh animal manure treatment were 11.333, 28.333 and 72.667 on SC10, SC176 and balady cultivars, respectively. While, they were 7.000, 21.000 and 70.000 on SC10, SC176 and balady cultivars under stored animal manure treatment, respectively. On the other hand, the mean of length of plants(cm), weight of 100 kernels (g) and yield per two rows(kg) under fresh animal manure treatment were 246.000, 31.333 and 8.933. Whereas, they were 267.55, 36.66 and 9.55 under stored animal manure treatment, respectively. Moreover, the length of plants(cm), weight of 100 kernels (g) and yield per two rows(kg) under fresh animal manure treatment were 281.000, 33.000 and 10.067 on SC 10, and were 256.333, 30.333 and 9.633 on SC176, and were 200.667, 30.667 and 7.100 on balady cultivars, respectively. While under stored animal manure treatment were 316.333, 39.333 and 11.117 on SC10, and were 265.667, 36.333 and 10.083 on SC176, and were 220.667, 34.333 and 7.467 on balady cultivar, respectively. These results indicated that under fresh animal manure, the severity of infection by turcicum leaf blifgt was high, while, the length of plants(cm), weight of 100 kernels (g) and yield per two rows(kg) were low comparing with treatment of soil by stored animal manure. These results were in the same line with which reported by Vargas-Garcia *et al.*, (2010), Neherd *et al*., (2015), Abo-Marzoka *et al*., (2016), Gerald (2019), Bradley (2019) and Mbong *et al*. (2020) , they found that, decomposing manure, properly made, will heat and kill disease early blight inoculums. They predicted that old farmyard manure or hardwood bark as a C source would suppress early blight disease more than fresh manure or softwood as a C source. Therefore, Heat generated during the composting process kills most weed seeds and pathogens. The microbial-mediated composting process lowers the amount of soluble nitrogen forms by converting animal wastes, there is little free ammonia or soluble nitrate; as a large amount of nitrogen is bound as proteins, amino acids, and other biological components. Generally, composted manure typically is more expensive than fresh or partially aged manure.

As regard to 2021 growing season, the obtained results in Figure 1 and Table 3 showed the same trend and had the same direct with which obtained during 2020 growing season.

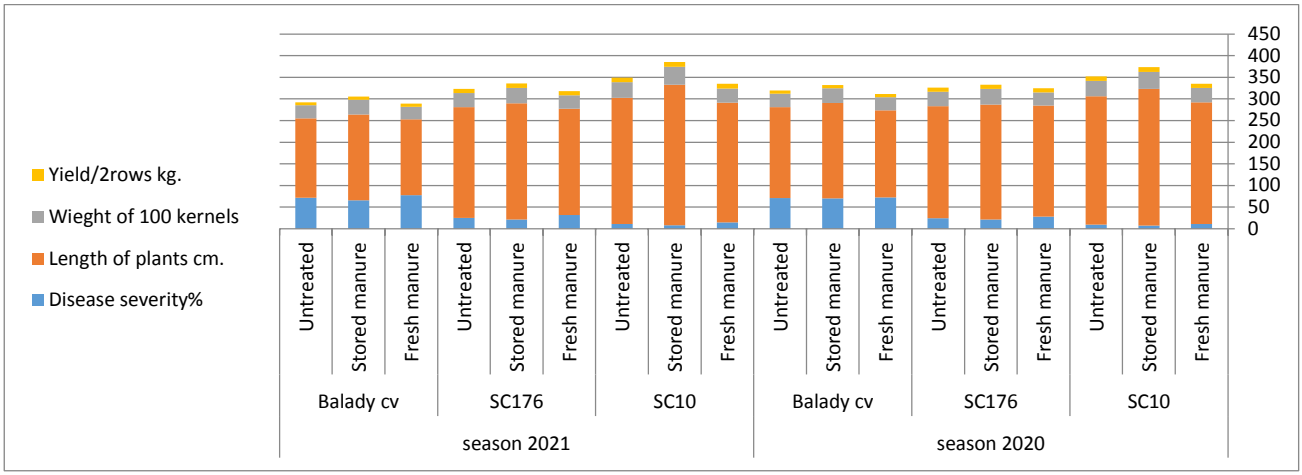

Fig. 1. Severity of infection % and three yield characters of three maize cultivars (SC10, SC176 and Balsdy cvs) were inoculated by turcicum leaf blight (TLB) disease under soil fertilized with fresh and stored animal farmyard manure during 2020 and 2021.

Table 3. Severity of infection % and three yield characters of three maize cultivars (SC10, SC176 and Balady) were inoculated by turcicum leaf blight (TLB) disease under soil fertilized with fresh and stored animal farmyard manure during 2021 growing season.

	Treatments	Severity of infection %	Length of plants(cm)	Weight of 100 kernels (g)	Yield per two rows(kg)
A	S.C. 10	10.889c	298.111a	36.778a	10.756a
	S.C. 176	25.889b	257.111b	32.889b	9.889b
	Balady	71.556a	185.778c	31.111b	7.244c
F test		**	**	**	**
B	Fresh animal manure	41.000a	233.111c	30.778c	9.061b
	Stored animal manure	31.667c	264.000a	37.000a	9.622a
	Untreated	35.667b	243.889b	33.000b	9.206b
F test		**	**	**	**
A×B	S.C. 10× Fresh animal manure	14.333g	277.333c	32.667c	10.400b
	S.C. 10× Stored animal manure	7.667i	325.333a	41.333a	11.267a
	S.C. 10× Untreated	10.667h	291.667b	36.333b	10.600b
	S.C. 176× Fresh animal manure	31.333d	246.333f	30.667d	9.733d
	S.C. 176× Stored animal manure	21.667f	268.333d	35.667b	10.067c
	S.C. 176× Untreated	24.667e	256.667e	32.333c	9.867cd
	Balady× Fresh animal manure	77.333a	175.667i	29.000d	7.050f
	Balady× Stored animal manure	61.667c	198.333g	34.000c	7.533e
	Balady× Untreated	71.667b	183.333h	30.333d	7.111f
F test		**	**	**	**

Data presented in Table 4 and Figure 3 showed that, the lowest turcicum leaf blight (TLB) severity was recorded in case of soil treatment by stored animal manure under spraying by tested fungicide and new natural substance ((Frankincense at 300 ppm) , it was recorded 1.000 and 4.333 in SC10, and was 2.667 and 9.667 in SC176, and 9.667 and 23.667 in balady cultivar , respectively , comparing with untreated ones , it were recorded 7.000 , 21.000 and 60.000 % in SC10, SC 176 and balady cultivar, respectively . in the revers, the highest turcicum leaf blight (TLB) severity was recorded in case of soil treatment by fresh animal manure under spraying by tested fungicide and new natural substance ((Frankincense at 300 ppm), it was recorded 4.333 and 7.667 in SC10, and was 5.667 and 19.333 in SC176, and 24.333 and 35.333 % in balady cultivar , respectively , comparing with untreated ones , it were recorded 11.333 , 28.333 and 72.667 in SC10, SC 176 and balady cultivar, respectively . On the other hand, the fungicide (dithane M45) was had the highest effect in decreasing turcicum leaf blight (TLB) disease severity comparing with spraying by new natural substance (Frankincense at 300 ppm) since, the new natural substance was decreased turcicum leaf blight (TLB) disease severity by equal about approximately 50 % comparing with untreated ones under all tested animal manure treatments at all tested maize cultivars Sheha *et al*. (2016).

Table 4. Effect of spraying by new natural substances (Frankincense at 300 ppm) and Fungicide (dithane M45) on restrict infection by turcicum leaf blight (TLB) disease under different tested treatments by farmyard animal manure during 2020 and 2021 growing seasons.

	Treatments	Severity of infection by turcicum leaf blight (TLB)% during season 2020			Severity of infection by turcicum leaf blight (TLB)% during season 2021		
		Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated	Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated
A	S.C. 10	2.556b	5.889c	9.333c	1.889c	5.111c	10.889c
	S.C. 176	4.222b	14.889b	24.444b	4.000b	14.444b	25.889b
	Balady	18.444a	30.222a	71.111a	17.667a	32.444a	71,556a
F test		**	**	**	**	**	**
B	Fresh animal manure	11.444a	20.778a	37.444a	10.889a	21.778a	41.000a
	Stored animal manure	4.444c	12.556c	32.667b	3.889c	11.778c	31.667c
	Untreated	9.333b	17.667b	34.778b	8.778b	18.444b	35.667b
F test		**	**	**	**	**	**
A×B	S.C. 10× Fresh animal manure	4.333de	7.667c	11.333f	3.333de	5.667g	14.333g
	S.C. 10× Stored animal manure	1.000f	4.333h	7.000h	0.000f	4.333g	7.667i
	S.C. 10× Untreated	2.333f	5.667h	9.667g	2.333e	5.333g	10.667h
	S.C. 176× Fresh animal manure	5.667d	19.333d	28.333c	5.000d	19.333d	31.333d
	S.C. 176× Stored animal manure	2.667ef	9.667f	21.000e	2.333e	8.333f	21.667f
	S.C. 176× Untreated	4.333de	15.667e	24.000d	4.667d	15.667e	24.667e
	Balady× Fresh animal manure	24.333a	35.333a	72.667a	24.333a	40.333a	77.333a
	Balady× Stored animal manure	9.667c	23.667c	60.000b	9.333c	22.667c	61.667c
	Balady× Untreated	21.333b	31.667b	70.667a	19.333b	34.333b	71.667b
F test		**	**	**	**	**	**

These results indicated the dangerousness using of fresh animal manure in soil fertilization because it contains much of fungal and oomycota pathogens, especially the soil borne pathogens and also contain very of insects eggs and wood seeds. These finding were in the same with which reported by Vargas-Garcia et al (2010), Neher et al. (2013) and Neherd et al (2015) which reported that decomposing farmyard manure have contrasting biochemical structure and resistance to decay. Hardwoods (decomposing farmyard manure) typically have a higher C:N ratio and higher lignin: cellulose ratio than softwoods (fresh manure)and straw, making them more resistant to decay and extending the longevity of the suppressive effect. They added that decomposing manure containing hardwood bark as a C source would suppress early blight disease and more other soil borne pathogens than manure with fresh or softwood as a C source. Bonanomi et al. (2007) and Neherd et al (2015) added that decomposing organic manure can serve as biological inoculants for field soils to reduce the severity of root diseases in natural and field systems. Disease suppression from decomposing manure is from heat and activity of oxidative enzymes which effected and may be killed the fungal and oomycota pathogens. On the other hand, these results indicated also that, the new natural substance (Frankincense at 300 ppm) was had slightly effect on decreasing turcicum leaf blight (TLB) disease severity , since, the TLB disease severity ranged from 4.333 to 35.333 comparing with untreated ones which ranged from 7.000 to 72.667 % . Moreover, the tested fungicide (dithane M45) was the highest effective in decreasing turcicum leaf blight (TLB) disease severity comparing with the new natural substance (Frankincense at 300 ppm) and untreated once. These results in the same line with which reported by Hamidpour et al (2013) and Ismail et al (2014) which showed that, the activity of Frankincense (boswellic acids) has been found to have antimicrobial activities against various microorganisms such as fungi, and gram-positive and gram-negative bacterial strains. frankincense have significant antimicrobial activity. In this assay, extracts of frankincense showed antimicrobial activity comparable with standard and can be used in combating the bacterial infested diseases caused by many bacterial strains.

Regarding the effect of spraying by new natural substances (Frankincense at 300 ppm) and Fungicide (dithane M45) on restrict infection by turcicum leaf blight (TLB) disease under different tested treatments by farmyard animal manure during 2021 growing season, data presented in Table 4 and Figure 3 showed the same direction with which reported in during 2020 growing season.

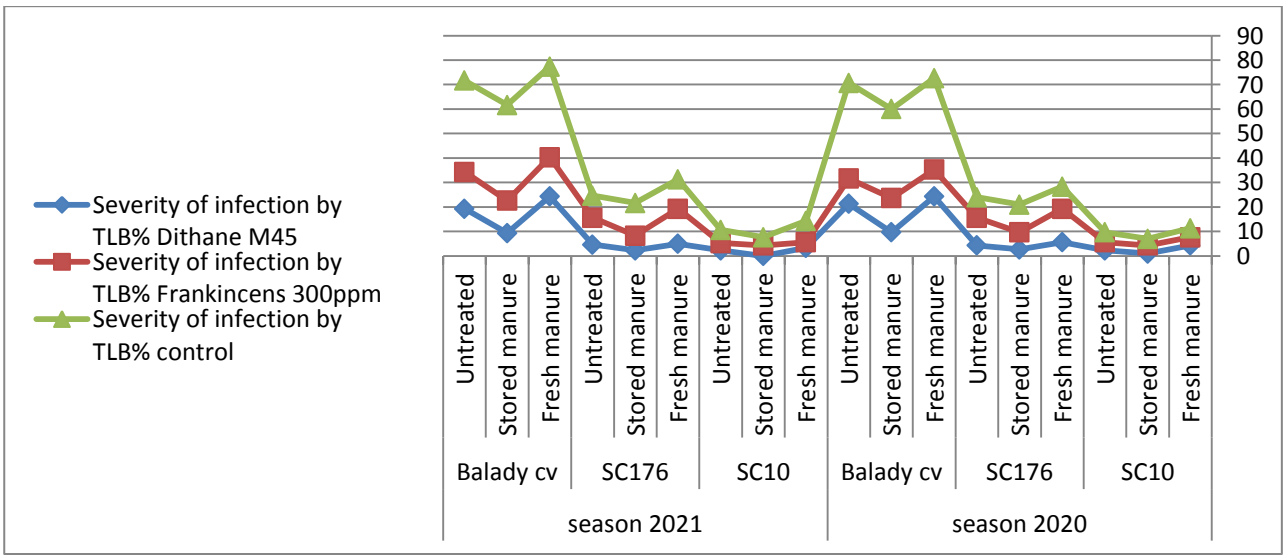

Fig. 3. Effect of spraying by new natural substance (frankincense at 300ppm) and fungicide (dithane M45) on restrict infection % by turcicum leaf blight (TLB) disease under fresh and stored farmyard animal manure during 2020 and 2021 growing seasons.

Table 5. Effect of spraying by Fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm on enhancement of length of plant (cm.) of three maize cultivars (SC10, SC 176 and balady) under artificial inoculation by turcicum leaf blight disease (TLB), at two different farmyard manure treatment during 2020 and 2021 growing seasons.

	Treatments	Season 2020			Season 2021		
		Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated	Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated
A	S.C. 10	270a	297.333a	297.889a	307.333a	286.778a	298.111a
	S.C. 176	264.111b	262.778b	260.444b	271b	261.778a	257.111b
	Balady	196.333c	192.889c	210.667c	198.667c	193.778b	185.778c
F test		**	**	**	**	**	**
B	Fresh animal manure	240.000b	236.778a	246.000c	244.111c	236.667c	233.111c
	Stored animal manure	240.889b	271b	267.556a	276.889a	258.111a	264.000a
	Untreated	249.556a	245.222c	255.444b	256b	247.556b	243.889b
F test		**	**	**	**	**	**
A×B	S.C. 10× Fresh animal manure	260.000c	275.667c	281.000c	283.333c	274.667b	277.333c
	S.C. 10× Stored animal manure	295.667a	327.667a	316.333a	332.000a	293.000a	325.333a
	S.C. 10× Untreated	280.333b	288.667b	296.333b	306.667b	292.667a	291.667b
	S.C. 176× Fresh animal manure	253.333c	251.333e	256.333d	258.333e	248.333c	246.333f
	S.C. 176× Stored animal manure	278.333b	277.667c	265.333d	286.667c	278.667b	268.333d
	S.C. 176× Untreated	260.667c	259.333d	259.333d	268d	258.333c	256.667e
	Balady× Fresh animal manure	186.333e	183.333h	200.667f	190.667g	187.00d	175.667i
	Balady× Stored animal manure	210.333d	207.667f	220.667e	212.000f	202.667d	198.333g
	Balady× Untreated	192.333e	187.667g	210.667ef	193.333g	191.667d	183.333h
F test		**	**	**	**	*	**

As regard to the effect of spraying by Fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm on enhancement of length of plant (cm.) of three maize cultivars (SC10, SC 176 and balady) at two different farmyard manure treatment during 2020 and 2021 growing seasons, data presented in Table 5 indicated that , the highest plant length was obtained in case of soil treatment with stored animal manure under spraying with fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm. Here, they were recorded in case of season 2020 as follow: 295.667 and 327.667 cm in SC10, 278.333 and 277.667 cm in SC176, and 210.333 and 207.667 cm in balady cultivar, respectively. While, it were recorded in case of season 2021 as follow : 332.000 and 293.000 cm in SC10 , 286.667 and 278.667 in SC176, and 212.000 and 202.667 cm in balady cultivar, respectively. The reverse was true and the lowest length of plants were obtained in case of soil treatment with fresh animal manure.

Table 6. Effect of spraying by Fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm on enhancement of weight of 100 kernels of three maize cultivars (SC10, SC 176 and balady) under artificial inoculation by tested disease, at two different farmyard manure treatment during 2020 and 2021 growing seasons.

Treatments		Season 2020			Season 2021		
		Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated	Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated
A	S.C. 10	38.889a	38.222a	36.000a	39.222a	36.889a	36.667a
	S.C. 176	35.778b	33.889b	33.333b	37.222ab	35.333b	32.889b
	Balady	34.444b	32.778b	32.000b	35.77b8	35.444b	31.111b
F test		**	**	*	*	**	**
B	Fresh animal manure	34b	32.111c	31.333b	34.444d	32.889c	30.778c
	Stored animal manure	40.111a	38.556a	36.667a	40.667a	39.222a	37.000a
	Untreated	35b	34.222b	33.333b	37.111c	35.556b	33.000b
F test		**	**	**	**	**	**
A×B	S.C. 10× Fresh animal manure	35.667c	34.667cd	33.000c	35.667d	33.667c	32.667c
	S.C. 10× Stored animal manure	44.333a	42.667a	39.333a	43.00a	40.667a	41.333a
	S.C. 10× Untreated	36.667c	37.333bc	35.667b	39.00b	36.333b	36.333b
	S.C. 176× Fresh animal manure	33.667de	30.667e	30.333d	34.333d	32.667c	30.667d
	S.C. 176× Stored animal manure	39.333b	38.333b	36.333b	40.333b	38.667a	35.667b
	S.C. 176× Untreated	34.333de	32.667de	33.333c	37.00bc	34.667bc	32.333c
	Balady× Fresh animal manure	32.667e	31e	30.667b	33.333d	32.333c	29.000d
	Balady× Stored animal manure	36.667c	34.667cd	34.333bc	38.667b	38.333a	34.000c
	Balady× Untreated	34de	32.667de	31.000d	35.333d	35.667bc	30.333d
F test		**	*	**	*	*	*

On the other hand, the same trend of data were obtained in case of the effect of spraying by Fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm on enhancement of weight of 100 kernels of three maize cultivars (SC10, SC 176 and balady) at two different farmyard manure treatment during 2020 and 2021 growing seasons which reported in table 6 ,and also in case of the effect of spraying by Fungicide (dithane M45) and new natural substances

Frankincense (*Boswellia serrate*) at 3000 ppm on enhancement of yield per two rows of three maize cultivars (SC10, SC 176 and balady) at two different farmyard manure treatment during 2020 and 2021 growing seasons, which reported in Table 7. Here, all obtained data in table 6 and 7 illustrated that, the highest weight of 100 kernels and the highest yield per two rows were obtained in case of fertilized of soil by storage animal manure on three tested maize cultivars, under spraying with fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm during two tested growing seasons. While, the lowest weight of 100 kernels and the lowest yield per two rows were obtained in case of fertilized of soil by fresh animal manure on three tested maize cultivars, under spraying with fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm during two tested growing seasons.

Table 7. Effect of spraying by Fungicide (dithane M45) and new natural substances Frankincense (*Boswellia serrate*) at 3000 ppm on enhancement of yield per two rows of three maize cultivars (SC10, SC 176 and balady) under artificial inoculation by tested disease, at two different farmyard manure treatment during 2020 and 2021 growing seasons.

	Treatments	Season 2020			Season 2021		
		Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated	Fungicide (dithane M45)	Natural substance (Frankincense at 300 ppm)	untreated
A	S.C. 10	10.903a	10.779a	10.539a	10.776a	10.661a	10.756a
	S.C. 176	10.017b	9.944b	9.850b	10.049b	9.98b	9.889b
	Balady	7.417c	7.344c	7.274c	7.443c	7.363c	7.244c
F test		**	**	**	**	*	**
B	Fresh animal manure	9.161c	9.094b	8.933c	9.219c	9.095c	9.061b
	Stored animal manure	9.788b	9.698a	9.556a	9.686a	9.594a	9.622a
	Untreated	9.388a	9.276b	9.144b	9.363b	9.314b	9.206b
F test		**	**	**	**	**	**
A×B	S.C. 10× Fresh animal manure	10.433c	10.317bc	10.067cd	10.497c	10.307a	10.400b
	S.C. 10× Stored animal manure	11.413a	11.343a	11.117a	11.077a	10.95a	11.267a
	S.C. 10× Untreated	10.863b	10.677b	10.433b	10.753b	10.727a	10.600b
	S.C. 176× Fresh animal manure	9.9e	9.817d	9.633e	9.913f	9.857a	10.067c
	S.C. 176× Stored animal manure	10.15d	10.1cd	10.083c	10.183d	10.083a	9.967d
	S.C. 176× Untreated	10e	9.917cd	9.833de	10.050e	10.00a	9.867cd
	Balady× Fresh animal manure	7.15h	7.15f	7.100g	7.247h	7.122b	7.050f
	Balady× Stored animal manure	7.8f	7.65e	7.467f	7.797g	7.750b	7.533e
	Balady× Untreated	7.3h	7.233f	7.167g	7.287h	7.217b	7.100f
F test		**	**	**	**	*	**

These results conducted on danger of using fresh animal manure on fertilization of maize plants, and also conducted on management of turcicum leaf blight (TLB) disease of maize using safety new natural substance (Frankincense (*Boswellia serrate*) at 3000 ppm). These results were in the same line with which reported by Ismail et al (2014) they showed that, Frankincense oil have the strongest mycelium growth inhibition of *F. monoliform* (61.11%), *F. proliferratum* (16.66%), *P.grisea* (33.33%), *B. oryzae* (33.33%), *R. solani*(44.44%), *A. brassicicola* (71.29%) and *A. flavus* (11.11%). They added that,Frankincense oil could completely inhibit spore germination of *F.monoliform*, *F.*

proliferratum, *P. grisea*, *B. oryzae*, *R. solani* and *A. brassicicola* (100%). Moreover, Hamidpour et al (2013) showed that, the activity of Frankincense (boswellic acids) has been found to have antimicrobial activities against various microorganisms such as fungi, and gram‐positive and gram‐negative bacterial strains.

Table 8. Means interaction between maize genotypes and fresh or stored animal farmyard manure, and their effect on maize grain content of oil, carbohydrates, fiber, ash, silica, phenols and protein % during 2020 growing season.

Treatments		maize grain content of oil, carbohydrates, fiber, ash, silica, phenols and protein % during season 2020						
		Oil%	Carbohydrates %	Fiber%	Ash%	Silica mg\100g	Phenols Mg\100g	Protein %
A	S.C. 10	6.046a	76.297b	2.477a	1.593a	464.237b	45.569c	11.866a
	S.C. 176	5.717b	78.244a	1.719c	1.319b	556.887a	57.164a	10.85ab
	Balady	5.982a	77.674ab	2.299b	1.461ab	465.59b	48.04b	10.319b
F test		*	*	**	*	**	**	**
B	Fresh animal manure	4.937c	75.333c	1.888c	1.553a	360.027c	43.502c	10.036c
	Stored animal manure	7.017a	79.478a	2.443a	1.354b	702.013b	58.538a	12.188a
	Untreated	5.791b	77.404b	2.163b	1.466a	424.673a	48.733b	10.811b
F test		**	**	**	**	**	**	**
331	S.C. 10× Fresh animal manure	5.557bc	74.033c	2.14c	1.69	279.71e	33.827e	10.837
	S.C. 10× Stored animal manure	6.847a	77.567b	2.867a	1.42	685.457b	61.12ab	12.69
	S.C. 10× Untreated	5.733b	77.29b	2.423b	1.67	427.543cd	41.76d	12.07
	S.C. 176× Fresh animal manure	4.407d	76.933b	1.38f	1.433	428.743cd	49.307c	9.96
	S.C. 176× Stored animal manure	6.937a	80.2a	1.98d	1.23	769.54a	64.533a	12.06
	S.C. 176× Untreated	5.807b	77.6b	1.797e	1.293	472.377c	57.653b	10.53
	Balady× Fresh animal manure	4.847cd	75.033c	2.143c	1.537	371.627d	47.373c	9.31
	Balady× Stored animal manure	7.267a	80.667a	2.483b	1.413	651.043b	49.96c	11.813
	Balady× Untreated	5.833b	77.323b	2.27c	1.433	374.1d	46.787c	9.833
F test		**	*	**	NS	*	**	NS

Data presented in Table 8 and Figure 4 showed that, the mean values of most tested grain components were high in SC10, they were 6.0465, 2.477% ,1.593%, 568.327 mg\100g and 11.866%for oil, fiber, ash, silica and protein, respectively. Moreover, the mean values of most tested grain components were also high in in case of fertilize of soil by stored farmyard animal manure, they were 7.017, 79.478%, 2.443%, 58.538, 702.013 mg\100g and 12.188% for oil, carbohydrates, fiber, phenols mg\100g, silica mg\100g and protein%, respectively, while, the reverse was true in case of ash content. On the other hand. the interaction between maize genotypes and kind of animal manure treatments indicated that, the highest values in most grain components were obtained in case of soil fertilized by stored farmyard animal manure at all tested maize genotypes with exception of ash % content. While the reverse was true in case of treatment of soil by fresh farmyard animal manure.

Table 9. Means interaction between maize genotypes and fresh or stored animal farmyard manure, and their effect on maize grain EC, Germination, radical and plume during 2020 growing season.

	Treatments	EC µmhos\g	Germination%	Radical, cm	Plume, cm
A	S.C. 10	11.882b	80.556b	12.844b	12.389
	S.C. 176	4.192c	85.556a	16.833a	12.222
	Balady	12.628a	75.556c	10.500b	14.056
F test		**	**	**	NS
B	Fresh animal manure	11.791a	75c	10.622c	11.778b
	Stored animal manure	7.377c	87.778a	15.667a	14.389a
	Untreated	9.534b	78.889b	13.889b	12.5ab
F test		**	**	**	**
A×B	S.C. 10× Fresh animal manure	15.113a	76.667c	8.867b	10.833
	S.C. 10× Stored animal manure	8.7d	86.667b	15.333a	15.167
	S.C. 10× Untreated	11.833bc	78.333c	14.333a	11.167
	S.C. 176× Fresh animal manure	6.027e	76.667c	15.000a	11.333
	S.C. 176× Stored animal manure	2.563g	95.000a	18.167a	13
	S.C. 176× Untreated	3.987f	85.000b	17.333a	12.333
	Balady× Fresh animal manure	14.233a	71.667c	8.000b	13.167
	Balady× Stored animal manure	10.867c	81.667bc	13.500ab	15
	Balady× Untreated	12.783b	73.333c	10.000b	14
F test		**	*	*	NS

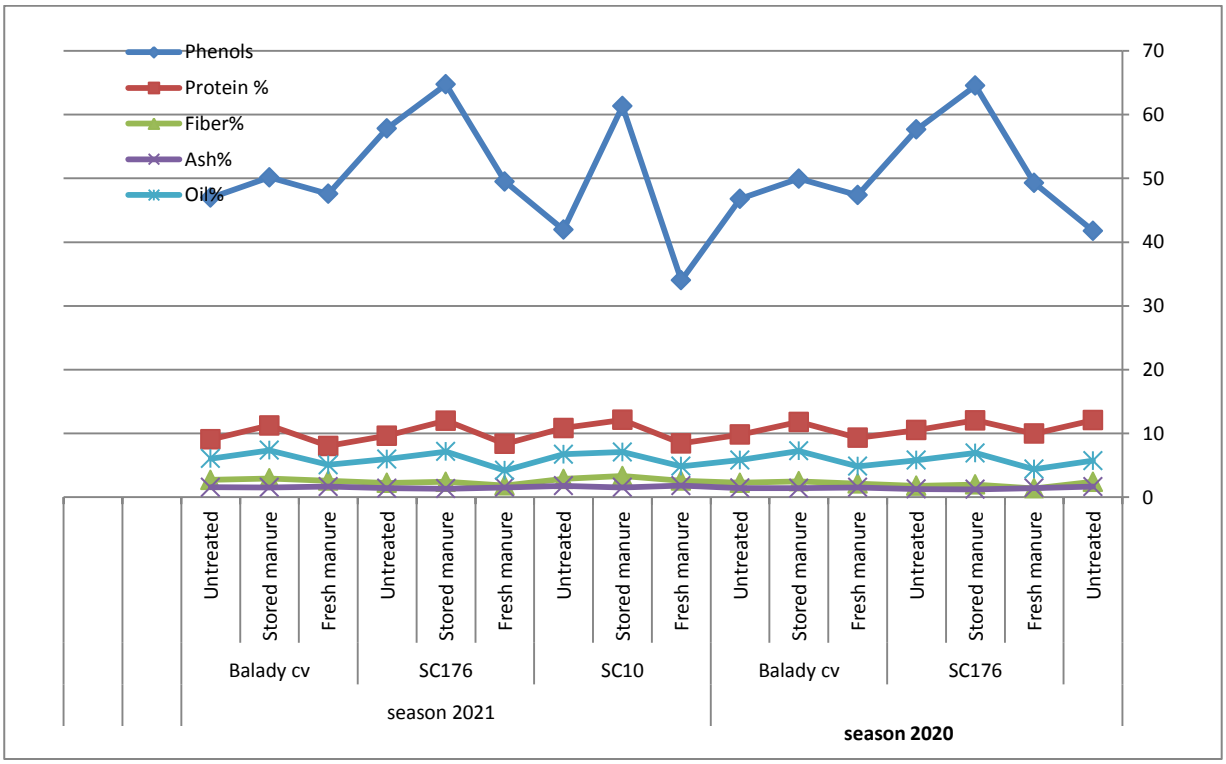

Fig. 4. Mean interaction between maize genotypes and fresh or stored animal farmyard manure, and their effect on grains content of oil, carbohydrates, fiber, ash, protein % and phenols during 2020 and 2021 growing seasons.

On the other hand, dada presented in Table 9 showed that, the highest germination %, the highest length of radical and plume cm were obtained from soil fertilized with stored farmyard animal manure, since it was 95.357%, 16.0232 cm and 2.041 cm in sc10, and was 93.690%, 18.857cm and 1.663cm in SC176 and was 89.023%,14.190 cm and 1.920 cm in balady cultivar, respectively, while, the revers was tree in case of fertilized with fresh farmyard animal manure and untreated ones. On the other hand, the EC was on the revers trend of both of germination %, radical and plume length. Moreover, during 2021 season, the data presented in Tables 10 and 11 were in the same trend with which reported during 2020 growing season (Tables 8 and 9).

Table 10. Means interaction between maize genotypes and fresh or stored animal farmyard manure, and their effect on maize grain content of oil, carbohydrates, fiber, ash, silica, phenols and protein % during 2021 growing season.

Treatments		maize grain content of oil, carbohydrates, fiber, ash, silica, phenols and protein % during season 2021						
		Oil%	**Carbohydrates, %**	**Fiber, %**	**Ash, %**	**Silica Mg\100g**	**Phenols mg\100g**	**Protein %**
A	S.C. 10	6.22a	78.214a	2.927a	1.713a	568.327a	45.759	10.468a
	S.C. 176	5.776b	80.641c	2.169c	1.439b	475.677b	57.354	10b
	Balady	6.164a	79.814b	2.749b	1.581ab	477.03b	48.23	9.448c
F test		*	**	**	*	**	**	**
B	Fresh animal manure	4.707c	77.362c	2.338c	1.673a	371.467c	43.892c	8.277c
	Stored animal manure	7.199a	81.652a	2.893a	1.474c	713.453a	58.728a	11.791a
	Untreated	6.254b	79.656b	2.613b	1.586b	436.113b	48.923b	9.848b
F test		**	**	**	**	**	**	**
A×B	S.C. 10× Fresh animal manure	4.853d	75.84	2.59c	1.81	291.15e	34.017e	8.437d
	S.C. 10× Stored animal manure	7.077ab	80.37	3.317a	1.54	696.89b	61.31a	12.127a
	S.C. 10× Untreated	6.73b	78.43	2.873b	1.79	438.98cd	41.95d	10.84b
	S.C. 176× Fresh animal manure	4.19e	78.74	1.83f	1.553	440.18cd	49.497c	8.363d
	S.C. 176× Stored animal manure	7.167ab	82.11	2.43d	1.35	780.98a	64.723a	11.997a
	S.C. 176× Untreated	5.97c	81.07	2.247e	1.413	483.81c	57.843b	9.64c
	Balady× Fresh animal manure	5.077d	77.50	2.593c	1.657	383.06d	47.563c	8.03d
	Balady× Stored animal manure	7.353a	82.47	2.933b	1.533	662.48b	50.15c	11.25a
	Balady× Untreated	6.063c	79.46	2.72c	1.553	385.54d	46.977c	9.063cd
F test		**	NS	**	NS	*	**	**

These results in the same trend with which reported by Tolba and Soad (2002) which found that, colonization of rot fungi in maize grains led to in carbohydrates content which may be due to fungi nutrition and may be also due to stimulated of grains respiration, resulting in loss of viability as manifested by poor germination. It also agreed with Bradley (2019) which showed that, if properly maintained a compost pile will generate its own heat through the microbial action involved in decomposing the compost materials. The temperature should reach between 120- 160 °f to ensure the killing of pathogens, parasites, and weed seeds, the temperature needs to be at least 131 ° f for 15 days. Cow manure is lowest in nutrients compared to other livestock manures. It typically has a high moisture content and generally requires a large amount of dry, animal manure should have sufficient carbon sources for composting. Animal manure should be composted or aged at least six months prior to use in gardens. Generally, do not apply fresh manure after field is planted. Gerald (2019) added that, Heat generated during the composting process kills most weed seeds and pathogens. Therefore, composted manure

typically is more expensive than fresh or partially aged manure.

Conclusion

Turcicum leaf blight (TLB) disease caused by *Exserohilum turcicum* showed low disease incidence in case of fertilized by decomposing animal manure comparing with which fertilized by fresh animal manure and control treatment. Moreover, high yield production (kg/2 rows), high weight of 100 kernels, high germination %, high length of both of radical and plume cm as well as high length of plants, and high percent of grain components (oil %, carbohydrates%, fiber%, silica, phenols, protein %), all were obtained also from plots which were fertilized by decomposing animal manure comparing with fresh animal manure control. The maize hybrids (SC10 and SC 176) were had suitable level of resistance to tested disease comparing with open pollinated variety (balady). Overall, this study recommended never use of fresh farmyard animal manure in fertilization of the soil. In the same respect, spraying of new natural substance extract which named Frankincense (*Boswellia serrata*) at 3000 ppm on maize plants 10 days after inoculation (45 days from sowing) resulted in decreasing of maize leaf blight disease severity and increasing of yield and their component.

Table 11. Means interaction between maize genotypes and fresh or stored animal farmyard manure, and their effect on maize grain EC, Germination%, radical cm and plume cm during 2021 growing season.

Treatments		EC µmhos\g	Germination, %	Radical, cm	Plume, cm
A	S.C. 10	13.872b	84.246a	13.534b	1.663ab
	S.C. 176	6.182c	86.246a	17.523a	1.508b
	Balady	14.618a	80.357b	11.19b	1.82a
F test		**	**	**	*
B	Fresh animal manure	13.781a	74.357c	11.312c	1.508b
	Stored animal manure	9.367c	92.69a	16.353a	1.875a
	Untreated	11.524b	83.801b	14.579b	1.609b
F test		**	**	**	**
A×B	S.C. 10× Fresh animal manure	17.103a	73.023d	9.557d	1.387
	S.C. 10× Stored animal manure	10.69d	95.357a	16.023b	2.041
	S.C. 10× Untreated	13.82bc	84.357bc	15.023b	1.562
	S.C. 176× Fresh animal manure	8.017e	77.357c	15.69b	1.451
	S.C. 176× Stored animal manure	4.553g	93.69a	18.857a	1.663
	S.C. 176× Untreated	5.97f	87.69b	18.023a	1.411
	Balady× Fresh animal manure	16.22a	72.69d	8.69d	1.685
	Balady× Stored animal manure	12.85c	89.023b	14.19c	1.920
	Balady× Untreated	14.77b	79.357c	10.69d	1.853
F test		**	**	**	NS

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تأثير التسميد بالسماد البلدي الطازج والسماد المخزن وكذلك الرش بمادة طبيعية جديدة على الإصابة بمرض لفحة أوراق الذرة الشامية وبعض الصفات المحصولية وكذلك التركيب الكيماوي للحبوب

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أوضحت نتائج البحث أن أصناف الذرة المختبرة سجلت شده مرضيه عالية بمرض لفحة الاوراق المتسبب عن الفطر *Exserohilum turcicum* وذلك في حالة التسميد بالسماد البلدي الحيواني الطازج مقارنة بالتسميد بالسماد البلدي المخزن لمدة من ٥-٦ اسابيع والكنترول (بدون سماد بلدي). وفوق ذلك فان التسميد بالسماد البلدي الطازج ليس فقط ادي الي زيادة الشده المرضية للمرض ولكن ادى ايضا الي انخفاض في قيم جميع الصفات المحصولية المختبرة وكذلك انخفاض في المكونات الكيمائية الهامه في الحبوب . وهذا يوضح لنا الخطورة المركبة من استخدام السماد البلدي الطازج في انتشار الامراض النباتية.
علي الجانب الاخر فان الهجن الفردية ١٠ و ١٧٦ كانت تملك مقاومه نسبيه للمرض تحت الدراسة مقارنة بالصنف البلدي المفتوح التلقيح . كذلك اوضحت الدراسة ان مرض لفحة اوراق الذرة الشامية قد سجل شده مرضيه عالية وهذا ممكن ان يكون بسبب الظروف الجوية المناسبة لهذا المرض خلال سنوات اجراء البحث. كذلك اوضحت النتائج ارتفاع في محصول الحبوب ووزن ال ١٠٠ حبه ونسبة الانبات وكذلك زياده في طول الريشة والجزير وبالتالي زياده في طول النباتات وايضا زياده في مكونات الحبوب من الزيت والكربوهيدرات والالياف الخام والسليكا والفينول والبروتين وذلك في حالة المعاملات المسمدة بالسماد البلدي المخزن (٥-٦ اسابيع) بالمقارنة بالمعاملات الغير مسمده. بينما ادي التسميد بالسماد البلدي الطازج الي انخفاض في كل القياسات السابقة باستثناء مكونات الحبوب من الرماد ودرجة التوصيل الكهربائي حيث سجلت قيم مرتفعة مقارنه بالسماد البلدي المخزون. من هذه النتائج يتضح اهمية استخدام السماد البلدي المخزن في تسميد التربة وعدم استخدام السماد الطازج مطلقا تبين هذه الدراسة ان رش النباتات بعد العدوي بالفطر المختبر بعشرة ايام (بعد ٤٥ يوم من الزراعة) بمستخلص البان الدكر (ماده طبيعية) بتركيز ٣٠٠ جزء في المليون ادي الي انخفاض في الشده المرضية بالمرض تحت الدراسة. بينما ادى رش النباتات بالميد الفطري دياثين م٤٥ (٤٥ يوم بعد الزراعة) كان اكثر فعالية في تقليل الشده المرضية بمرض لفحة اوراق الذرة الشامية بالمقارنة بالمادة الطبيعية (اللبان الدكر) وكذلك بالمقارنة بالمعاملة الكنترول. وفي نفس السياق فان المادة الطبيعية والمسماة بمستخلص اللبان الدكر تحتاج الي مزيد من الاختبارات في المستقبل لإنتاج مستخلص تجاري منها يستخدم في مكافحة مرض لفحة اوراق الذرة الشامية.

الكلمات المفتاحية: السماد البلدى المخزن والطازج. الذرة الشامية- مرض لفحة الأوراق في الذرة الشامية.