J. Agric. Chem. and Biotechn., Mansoura Univ. Vol. 10(7): 141 - 143, 2019

Effect of Seed- Dressing Fungicides and Seed- Rate on Incidence of Flax Seedling Blight

Ashour, A. Z. A.; A. A. Aly; Amal A. Asran and S. M. E. Zayed
Plant pathology Research Institute, Agricultural Research Center (ARC), Giza, Egypt

ABSTRACT

A two- years field study was conducted at Sakha Agricultural Research Station to evaluate 24 combinations of seeding rates and seed-dressing fungicides in controlling flax seedling blight.The seedling rates were 30,40,50, and 60 Kg/fedd. and the fungicides were Vitavax 300, Rizolex T, Sun light , Moncern T, and Maxim AP. The results of the present study provided an evidence that the reduction of seed rate from 60 Kg of untreated seed to 30 Kg of treated seed did not result in any negative impact on stand, seed yield, and straw yield. It is worth noting that this reduction increased stand in some cases. Therefore, seed – dressing fungicides could help reduce rate of seeding to 50% of that of untreated seed. This result is of a considerable economic importance due to the steady increase in flax seed price and the increasing need of seed for oil industry.

Keywords: Fungicides; Seed – dressing; Seed – rate; Flax seedling blight.

INTRODUCTION

Seedling blight of Flax *(Linum usitatissimumL.*) is caused by a variety of soilborne fungi, the most important of which are *Rhizoctonia solani* and *Fusarium* spp. In particular. *F.oxysporum* (Aly *et al*., 2011 and Aly *et al*.,2013)other fungi such as *Pythium* spp. may also be involved in the disease although their role is less important (Nyvall,1981).

These nonspecialized fungi have a wide host range, therefore rotation of flax with other crops is questionable practice for the disease control (Nyvall,1981).Control of flax seedling blight by selection of blight resistant cultivars has not been emphasized in the development of commercial flax cultivars because of the lack of sources of such a resistance (Tsiang,1947 and Anonymous,1972).Consequently, seedling blight of flax is controlled by other means and largely by seed -dressing fungicides ((Nyvall,1981and Martens *et al*.,1984).Seed treatment may actually double or triple the stand, particularly when samples have a high percentage of damaged seeds. The value of seed treatment; however, varies tremendously, not only with the seed lot but also with the region where flax is grown. In many parts of the world seed treatment is distinctly beneficial, whereas in other regions it may be of little value. In general tests indicate that the more extensive the seed coat injuries, the greater the need for seed treatment, and the greater the benefit obtained (Christensen, 1954).

The application of fungicides is a common practice for controlling *R.solani* on many crops (Djebali and Belhsssen, 2010; Sharma and Chandel, 2013; Liu and Khan, 2016; Neelam and Gajendra Singh,2017; and Pankaj *et al*., 2018). Similary, fungicides are widely used for controlling Fusarium diseases (Sanju *et al* .,2014;Akgul and Erkilic,2016;Sanjay and Ansari,2017;Wavare *et al.*,2017;and Bashir *et al*., 2018). On the contrary, the use of seed- dressing fungicides for controlling flax seedling blight is not a common practice among flax growers in Egypt. This lack of concern could be attributed to over seeding, which compensates for seedling stand losses. Thus, a standard seed rate as high as 60kg/fedd. is recommended for obtaining maximum yield.

Due to this lack of concern, the literature concerning the efficiency of seed – dressing fungicides in controlling flax seedling blight under Egyptians conditions is very scarce (Michail *et al*., 1973; Youssef *et al*.,1984;Amr *et al*., 1987;and Khalil *et al*., 1992).

The present investigation is an attempt to explore the possible utilization of seed – dressing fungicides and seed rates for obtained maximum stand. This study necessitated sowing different combinations of seed rates and seed-dressing fungicides. It was also of interest to determine the effects of these combinations on seed yield and straw yield.

MATERIALS AND METHODS

Isolation and identification of soilborne fungi from the experimental plots:

Infected seedlings, which showed typical seedling blight symptoms were removed from the field and washed under tap water to removed any adhering soil. Small pieces of necrotic tissues were surface sterilized with 10% Clorox solution for two min.,and washed several times with sterilized water. The surface sterilized pieces were then dried on sterilized filter papers and placed on potato dextrose agar (PDA)medium amended with streptomycin sulfate and rose bengal to eliminate bacterial contamination. The plates were incubated at 20±3 ° C for three to seven days. The developing colonies were identified according to Gilman (1966) and Barenet and Hunter (1979).Colonies of each fungus were expressed as percentage of the total developing colonies.

Field trials:

The present investigation was carried out at Sakha Agricultural Research Station during 2015/2016 and 2016/2017 growing seasons. Each season, experimental plots were established in a field known to be infested with flax seedling blight pathogens (Table 1).The tested fungicides (Table 2) were added to slightly moist seeds of flax cultivar Giza 10 at the recommended rates (Table 2).Treated seeds were shaken thoroughly in plastic bags for five min., and allowed to dry before being dispensed in paper bags for storage until the time of use. In the control treatments ,no fungicides were added to seeds. Within a week after treatment, seeds were sown, manually in the first season ,and mechanically in the second season, in 4x1.5-m plots in a randomized complete block design with four replicates. Seed rate were 171. 4,142.9,114.2 and 85.7 g/plot, which were equivalent to 60,50,40,and 30kg/fedd. respectively. In the first season, stand was recorded 60 days after planting in a 40 x 40-cm randomly selected area in each plot. In the second season, stand was recorded in the four middle rows of each plot. Straw yield and seed yield were recorded for each plot at harvest to determine straw yield and seed yield /fedd.

Statistical analysis of the data:

The experimental design of field trials was a randomized complete block with four replicates Least significant difference (LSD) was used to compare treatment means. Analysis of variance (ANOVA) was carried out by MSTAT-C statistical packge.Data of each season were subjected to ANOVA independently because of differences in environmental conditions, management practices, and methods of each season.

RESULTS AND DISCUSSION

Rhizoctonia solani showed the highest isolation frequencies in both seasons. *Fusarium* spp. were also isolated in both season but their frequencies were significantly much lower than those of *R.solani* (Table 1).These fungi are considered major causes of flax seedling blight in Egypt (Aly *et al.*, 2011and Aly *et al.*, 2013).On the other hand , the other isolated fungi, except *M.phasolina* and *Alternaria* spp.,are not reported as root pathogens of flax (Aly *et al*.,2011)Therefore, the disease pressure in the experimental plots was due mainly to *R.solani* in both season.

Table 1. Frequncey of fungi isolated from flax seedlings infected with postemergence damping- off in the experimental plots of Sakha Agricultural Research Station.

Fungus	Isolation Frequency (%)[a] in 2015 /2016[b]	2016 /2017[c]
Alternaria spp.	14.72	0.00
Aspergillus spp.	7.22	36.01
Chaetomium spp.	18.89	0.00
Fusarium spp.	13.06	21.31
Rhizoctonia solani	43.61	42.68
Trichoderma spp.	2.50	0.00
LSD (p≤ 0.05)	15.19	7.44

[a] **Colonies of each fungus were expressed as the percentage of the total developing colonies. Each value was the mean of five (b) or three (c) replicates (plates).**

Table 2. Seed-dressing fungicides used in the present study and their active ingredients.

Fungicide[a]	Application rate (per kg seed)	Active ingredient[b]	Formulation[c]
Vitavax 300	3g	37.5%Caboxin + 37.5%Captan	WP
Rizolex T	3g	20 %Tolclofos–methyl + 30% Thiram	WP
Sun light	2g	20% Simeconazole	WP
Monceren T	3g	15% Pencycuron+32%Thiram	WP
Maxim AP	2ml	3.5%(MetalaxylM+Fludioxonil)	FS

[a]**Trade name** [b]**Common name**

[c] **Formulation were wettable powder (WP) and flowable formulation for seed treatment (FS)**

In 2015/2016 growing season (Table 3), the efficiency of fungicides in controlling the disease varied depending on the used seed rate.Thus,Monceren T was only effective fungicide controlling the disease (p≤ 0.10)when the seeds were sown at a rate of 60kg.when the seeds were sown at rate of 50 kg, Rizolex T and MoncernT significantly increased stand. All the fungicides were ineffective in controlling the disease when seeding rate was 40kg.Vitavax 300 was the only effective fungicide (p≤ 0.10)when the seed rate was reduced to 30Kg. Moncernen T was the most efficient fungicides in controlling the disease as it increased stand by 55.36% when the seedling rate was 50Kg.

The increase in seed rate in 2015/2016 tended to show reduction in stand when the seeds treated with fungicides. In the case of Moncernen T in 2015/2016 season and in 2016/2017season, it was not possible to detect any significant differences in stand in spite of the noticeable increases in seed rate (Table 3). The only way to speculate on these results is that the higher rates of seeding, when they were accompanied with protection against soil-borne pathogen, resulted in considerable increases in emerging seedlings. Thus, a very high level of competition may occur interfering with the continuation of growth of a large portion of the germinating seeds.

In both seasons, in the absence of seed treatment with fungicides, it was not possible to detected any significant differences in stand in spite of the noticeable differences in seeding rate (Table 3) The only possible explanation for this lack of significant differences is that in the absence of fungicides, the pathogenic soil -borne fungi attacked seedlings during germination and initial establishment causing reduction in the number of surviving seedlings. This reduction was so severe that the low stand of the untreated seeds obscured any potential increases in stand due to the increasing seed rates.

In 2015/2016, all the fungicides were ineffective in increasing seed yield regardless of the used seed rate (Table 4).Similarly, the increase in seed rate did not cause significant increase in seed yield whether the seeds were treated or not treated with fungicides. In 2016/2017,the fungicides did not show significant effects on seed yield when the seeds were sown at rates of 50 and 60 kg/fedd.Vitavax 300 and Sun light showed deleterious effects on seed yield when the seed rate increased from 30 to 40 kg/fedd. (Table 4).

In both seasons, straw yield was not affected by fungicides regardless of the used seed rate (Table 5). Similarly, the increases in seed rate, in both years, did not show significant effects on straw yield whether the seeds were treated or not treated with fungicides (Table 5).

Table 3. Effect of different combinations of seed-dressing fungicides and Seed rates on flax stan under field conditions

Fungicide	Year 2015/ 2016 Seed Rate (kg/fedd.)				Year 201٦/ 201٧ Seed Rate (kg/fedd.)			
	60	50	40	30	60	50	40	30
Vitavax 300	109.50[a]	112.25	95.75	184.50	152.50[b]	168.25	173.00	198.25
Rizolex T	109.75	148.25	140.00	170.00	191.00	158.50	203.00	162.25
Sun light	78.00	123.00	155.25	142.75	185.25	213.00	186.25	202..00
Monceren T	150.00	155.75	143.25	142.25	175.75	176.50	126.25	181.75
Maxim AP	108.75	86.75	151.50	160.00	184.25	235.25	207.00	197.00
Control	107.50	100.25	117.50	138.50	237.25	231.25	210.00	177.50

F.value = 2.47 and P>F =0.002 F.value = 1.06 and P>F = 0.406.
LSD (P≤ 0.05) = 49.20 LSD (P≤ 0.١٠) = 41.52

[a]**Manual planting and each value is the number of plants in a 0.16m²area (0.40X0.40m) and calculated from four replicates.**

[b]**Mechanical planting and each value is the number of plants in two - meter long row and calculated from four rows.**

Table 4. Effect of different combinations of seed-dressing fungicides and seed rates on seed yield (ton/fedd.) under field conditions

Fungicide	Year 2015/ 2016 Seed Rate (kg/fedd.)				Year 201٦/ 201٧ Seed Rate (kg/fedd.)			
	60	50	40	30	60	50	40	30
Vitavax 300	0.57[a]	0.60	0.57	0.58	0.59[b]	0.60	0.58	0.65
Rizolex T	0.55	0.59	0.57	0.61	0.64	0.58	0.58	0.60
Sun light	0.58	0.58	0.60	0.58	0.61	0.61	0.57	0.65
Monceren T	0.59	0.58	0.55	0.56	0.59	0.58	0.62	0.65
Maxim AP	0.55	0.57	0.59	0.56	0.63	0.61	0.61	0.60
Control	0.57	0.58	0.57	0.56	0.61	0.58	0.66	0.61

[a]**Mean of four replicates.** [b]**Mean of four replicates F.value = 0.73 and p > F = 0.80 F.value = 1.50 and p > F = 0.10 LSD (P≤ 0.10) = 0.05**

In conclusion, the results of the present study provided an evidence that the reduction of seed rate from 60 kg of untreated seed to 30 kg of treated seed did not result in any negative impact on stand, seed yield, and straw yield. It worth noting that this reduction increased stand in some cases. Therefore, seed-dressing fungicides could help reduce rate of seeding to 50%of that of untreated seed. This result is of a considerable economic importance due to the steady increase in flax seed price and the increasing need of seed for oil industry.

Table 5. Effect of different combinations of seed-dressing fungicides and seed rates on straw yield (ton/ fedd.) under field conditions.

Fungicide	Year 2015/ 2016 Seed Rate (kg/fedd.)				Year 201٦/ 201٧ Seed Rate (kg/fedd.)			
	60	50	40	30	60	50	40	30
Vitavax 300	3.23[a]	3.31	3.43	3.25	3.21[a]	3.25	3.40	3.10
Rizolex T	3.20	3.34	3.35	3.53	3.33	3.17	3.32	3.26
Sun light	3.32	3.37	3.51	3.65	3.33	3.16	3.62	3.04
Monceren T	3.43	3.04	3.24	3.32	3.20	3.30	3.29	2.92
Maxim AP	3.31	3.13	3.32	3.42	3.05	3.17	3.31	3.19
Control	3.57	3.29	3.38	3.35	3.18	3.31	3.00	3.23

[a]Mean of four replicates. [b]Mean of four replicates. F.value = 0.88 and p > F = 0.62 F.value = 0.74 and p > F = 0. 78

REFERENCES

Aly, A. A., M. R. Omar, M. T.M. Mansour, S.M. E. Zayed ,and K.A. Abd- Elsalam .2011. Fusaria and other fungi associated with seedling blight and root rot of flax in the Nile Delta. Plant Pathologyand Quarantine 1:89- 102.

Aly, A.A., E.M. Hussein, Amal A. Asran, Ola G.H.El-Hawary,A.A.Mosa,and M.H.Mostafa.2013.Non-Differential interaction between isolates of *Rhizoctonia solani* and flax cultivars. ICEL AGRIC SCI 26: 37-44.

Akgul,D.S.and A.Erkilic.2016. Effect of wheat cultivars, fertilizers, and fungicides on Fusarium Foot rot disease of wheat.Turkish Journal of Agriculture and Forestry 40:101-108.

Amr,Afaf M.,H.A.Eisa,B.A.Youssef,and M.S.Khalil.1987. Effect of different fungicides on the relative severity of damping- off disease of flax.Agric. Res. Rev.65:173-180.

Anonymous.1972.Flaxseed farming and flax products. The Flax Development Committee. The Flax Institute of the United States.Minn.25p.

Bashir,M.R.,A.Muhammad,S.Muhammad,M.Muhammad, A.Waseem,M.W.Alam,and B.Muhammad.2018.Antifungal exploitation of fungicides against *Fusarium oxysporum* f. sp.*capcici* causing wilt of chilli pepper in Pakistan. Environmental Science and Pollution Resrarch 25:6797 – 6801.

Barnett,H.L.and B.B.Hunter. 1979.”Illustrated Genera of Imperfec fungi” 3rd Ed. Burgess Publishing Company,Minneapolis, Minnesota. 241p.

Christensen, J.J.1954.The present status of flax diseases other than rust. Adv.Agron.6:161 – 168.

Djebali,N.and T.Belhassen.2010.Field study of the relative susceptibility of elven potato (*Solanum tuberosum L.)* varieties and the efficacy of two fungicides against *Rhizoctonia solan*i attack. Crop Protection 29:998 – 1002.

Gilmen, J.C.1966. “A Manual of soil fungi” 2ndEd.The Iowa State University Press, Iowa.450p.

Khalil, M.S.,A.A.Aly,E.A.EL-Kady, and H.A.Eisa.1992. Impact of chemical control of flax seedling Blight on seed rate ,yield, and yield components. Menofiya J.Aric.Res.17:1727 – 1733.

Liu, Y.and M.F.R.Khan.2016.Utility of fungicides for controlling *Rhizoctonia solani* on sugar beet. Journal of crop Protection 5: 33 – 38.

Martens, L.W., W.L.Seaman,and T.J.Atkinson, eds. 1984”.Diseases of field Crops in Canada”The Canadian Phytopathologyical Society, Ontario.160p.

Michail, S. H., H.Elarosi, A.Abd El-Rehim, and Enaiat A.Khairy.1973.Hot-water treatment and Fungicidal dressing of seed for the control of damping -off of cotton and flax. Phytopathologia Mediterranea 12: ١11- 113.

Neelam,K. and K.P.S. Gajendra Singh. 2017. Evolution of systemic and non- systemic fungicides Against *Rhizoctonia solani* causing blight in urdbean .Journal of Hill Agriculture 8:206-٢٠٩

Nyvall,R.F.1981.”Field Crop Diseases Handbook” Avi Publishing Company,INC.Connectict.436p.

Pankaj,K.., S.Ahlawat, R.Chauhan, A.Kumar,R.Singh, and A.Kumar.2018.*In vitro* and field efficacy of fungicides against sheath blight of rice and post – harvest fungicides residue in soil, husk, and brown rice using gas chromatography -tandem mass spectrometry. Environmental Monitoring and Assessment 190:503.

Sanjay,Y,and M.M.Ansari.2017.Isolation ,identification, and *in vitro* evaluation of fungicides against *Fusarium* and leaf blight of soybean caused by *F.oxysporum*. Society of Soybean Research and Development 15:46- 55.

Sanju, C.,K.S.Shekhawat, G.L.Kakraliya,and M.k.Jat. 2014.Effect of systemic and non-systemic fungicides on wilt of fenugreek incited by *Fusarium oxysporum* .Plant Disease Research 29:217- 218.

Sharma, S.and S.Chandel.2013.Mangement of stem rot (*Rhizoctonia solani*) of carnation by Fungicides. Journal of Mycoloy and Plant Pathology 43: 187 – 189.

Tsiang,C.T.1947.Studies on root rot of flax caused by *Rhizoctonia solani* Kühn.Ph.D.Thesis Univ. Minnesota, St.Paul.100p

Waváre,S.H.,R.M.Gada,and A.V.Shtole,2017.Antifungal efficacy of floral extracts, biocontrol agents and fungicides against *Fusarium oxysporum* f.sp.*ciceri.* Indian Phytopathology 70:191- 199

Youssef ,B. A., Afaf. M. Amer. M.S. Khalil,and T.A.El-Sharkawy.1984.Vitavax formulations for the control of seedling diseases of flax. Agric. Res.Rev.62.123 – 129.

تأثير المطهرات الفطرية الكاسية للبذرة ومعدل التقاوي علي حدوث لفحة بادرات الكتان

عبد الودود زكي عبد الله عاشور، على عبد الهادي على ، أمل عبد المنجي عسران و شوقي محمد المتولي زايد

معهد بحوث أمراض النباتات ، مركز البحوث الزراعية ، الجيزة ، مصر

أجريت تجربة حقلية لمدة عامين بمحطة البحوث الزراعية بسخا، لتقييم ٢٤ معاملة مختلفة، هي عبارة عن توافيق لاربعة معدلات تقاوي وخمسة مطهرات فطرية تستعمل لمعاملة البذرة. زرعت التقاوي بمعدلات٣٠ ،٤٠،٥٠ ، ٦٠ كجم / فدان بعد أن عوملت بالمطهرات الفطرية فيتافاكس ٣٠٠ و ريزولكس تي وصن لايت ومونسرين تي و ماكسيم . تبرهن الدراسة الحالية علي انه من الممكن تخفيض معدل تقاوي الكتان المستعملة في الزراعة بنسبة٥٠ % وذلك من ٦٠ كجم/ فدان من البذرة الغير معاملة إلي ٣٠ كجم /فدان من البذرة المعاملة دون أن يترتب علي ذلك أي تأثيرات سلبية علي عدد النباتات القائمة ومحصول البذرة ومحصول القش . الجدير بالذكر أن هذا الانخفاض أدي - أحياناً- إلي زيادة في عدد النباتات القائمة. كما أن هذا الانخفاض في معدل التقاوي المستعملة في الزراعة له اهمية كبيرة من الناحية الإقتصادية نظرا للزيادة المضطردة في سعر بذرة الكتان بألاضافة لما لها من أهمية صناعية متزايدة في إنتاج الزيت.