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EFFECT OF DRY HEAT TREATMENTS ON SEED VIGOR AND HEALTH OF SOME RICE CULTIVARS

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ABSTRACT

The present work was conducted at Laboratory of Seed Technology Research Unit, Mansoura during 2012 year to study the effect of dry heat treatments (50 ^{o}C , 60 ^{o}C , 70 ^{o}C and without heating) for (1 , 2 and 3 days) of some rice cultivars (Sakha 104, Sakha 103 and Giza 178) on seed quality. The obtained results showed that Giza 178 cultivar showed the highest results of seed and seedling vigor characters as compared with other cultivars. Dry heat of all cultivars under study at 60 ^{o}C for 2 days produced the highest mean of germination percentage, seed and seedling vigor. The lowest values of seed germination, seed vigor and seedling vigor of mentioned cultivars were obtained by heating at 70 ^{o}C for 3 days . The percentage of seeds infection with fungi decreased at 60 ^{o}C for two days , there was a decrease in *Alternaria padwickii*, *Alternaria tenuis*, *Bipolaris oryzae* with seed in all studied cultivars and elimination of *Fusarium moniliforme, Fusarium semitectum, Helminthosporium sp*, *Rhizoctonia solani, Sarocladium oryzae, Stemphylium botryosum* with seed of Sakha 103 and Giza 178 cultivars. Stepwise regression analysis revealed that *A. padwickii, B. oryzae, F. graminearum, Fusarium semitectum, Helminthosporium sp***,** *R. solani, Sarocladium oryzae,* as significantly contributing variables to variation in germination %. Furthermore, negative and significant correlation coefficient was recorded between germination % and *A. padwickii , B. oryzae, F. graminearum .* While the negative correlation coefficient between germination % and *F. moniliforme, F. semitectum, R. solani, S.oryzae* was not significant.

Finally, it could be concluded that heating of rice seed at 60 ^{o}C for 2 days is a good mean for controlling seed borne disease and enhancement of seed vigor.

Keywords: Rice , Dry heat, seed - borne fungi , seed vigor.

INTRODUCTION

High quality seed should be free from seed-borne diseases, insects and other extraneous matter. They should also be free from various types of mechanical injury that reduce germination and seedling vigor .Dry heat treatments of seed are used for many purposes , one is to reduce their moisture content to level, which prolongs longevity during storage condition (Somado *et al*., 2006),the second is to control the external and internal seed borne pathogens including fungi, bacteria, virus and nematodes (Detry,1993). Besides pathogen control , dry heat can also kill weed seeds (Czerniakowski, 1993).

The range of dry heat temperature differs according to crop and purpose of treatments. Dadlani and Seshu (1990) showed that dry heat treatment (65 ^{o}C , 7 days) resulted in considerably lower fungal infection incidence and did not have any adverse effect on seed germination and seedling vigor of rice seed . In general, high temperature (80 and 90 ^{o}C) in

dry heat treatment reduces seed viability (germination percentage, emergence percentage) and seedling vigor (seedling height and dry weight) as compared with the control, but optimum temperature promotes seed germination and seedling emergence in cereal crops (Lee *et al*.,2002). Incubation of cotton seed at 60°C markedly improved seedling emergence and vigorous growth (Basra *et al.*, 2004). None lethal heat shock treatment before radicle emergence effectively promoted the germination of barely and wheat seeds (Dell Aquilla and Di Turi, 1996) . Farooq *et al*., (2004) reported that heat treatment of rice seed at 40 ^{o} C for 72 h gave the highest germination energy and germination index as compared with control.

Contamination of seed and grain with fungal organisms may result in poor germination, seedling vigor or grain quality. Fungi usually invade grain or seed during storage and are generally not present in large quantities before harvest in the field. Agarwal *et al.*,(1989) demonstrated that pathogenic seed-borne fungi of rice are major importance and provoke substantial losses. *B.oryzae* caused 11.0 to 37.3 % reduction in rice seed germination (Padmanabhan, 1977).Thermotherapy, which includes hot water, hot air , solar heat are an effective ways of eliminating seed-borne fungal pathogens (Agarwal and Sinclair, 1987). Dry heat can eliminate some seed-borne fungi (Takano *et al*., 1985). Clear *et al*., (2002) found that *F. graminearum* was eliminated from seed of RS2 spring wheat cultivar after 15 days at 60°C, 5 days at 70°C, or 2 days at 80°C.

The aim of this work was to study the efficiency of dry heat treatments to promote seed vigor and controlling seed – borne fungal diseases without any adverse effects on rice seed and seedling vigor of some Egyptian rice varieties.

MATERIALS AND METHODS

This study was performed in the year 2012 at the Laboratory of Seed Technology Research Unit, Mansoura, Egypt, to study the effect of three heat treatments (50 , 60 and 70 ^{o}C) with three periods (1, 2 , 3 days) on rice seed quality. The experiment was arranged in a completely randomized design with four replicates. Rice seeds were obtained from Central Administration of Seed (CAS). Seeds (100 g) of three rice cultivars (Sakha 104, Sakha 103 and Giza 178) were pretreated previously with forced hot air (Germany RETSCH).The moisture content of seeds was about 13 ± 1 before treatments, after treatments seeds were kept at room temperature for 5 days. Germination tests were carried out in sterilized Perti dishes (15 × 1.5 cm) covered at the bottom with three layers of Whatman No.1 filter paper that had been then autoclaved. Each dish included 50 seeds and moistened with 10 ml of water and incubated in the growth chamber at 25 ± 2 ^{o}C and germination was observed daily to study the following characters:

I-Seed vigor traits:

1- Germination percentage (G%) : It was calculated by counting only normal seedling 14 days after planting according to (ISTA rules ,1999).

2- Speed germination index (SGI): It was calculated as described in the Association of Official Seed Analysis (AOSA,1983) by the following formula:

$$SGI = \frac{\text{No. of germinated seed}}{\text{Days of first count}} + \frac{\text{……}}{\text{……..……}} + \frac{\text{No. of germinated seed}}{\text{Days of final count}}$$

The seeds were considered germinated when the radicle was at least 2 mm. long.

3- Germination energy (GE): It is the percentage of germinated seeds 4 days after planting relative to the total number of seeds tested (Ruan *et al*., 2002).

4- Germination rate (GR): It was defined according to the following formula of Bartllett,(1937).

$$GR = \frac{a + (a+b) + (a + b + c) \text{ ……..} (a + b + c + m)}{n\,(a + b + c + m)}$$

Where a, b, c,m are No. of seedlings in the first, second , third and final count, n is the number of counts.

5- Co-efficient of germination (CG): It was calculated using the following formula (Copeland, 1976)

$$\text{Co-efficient of germination} = \frac{100\,(A_1 + A_2 + \text{……..} A_n)}{A_1T_1 + A_2T_2 + \text{…….. } A_n\,T_n}$$

Where ,

A = Number of seed germinated .

T = Time (days) corresponding to A.

n = No. of days to final count.

6- Mean germination time (MGT): It was calculated based on the following equation of Ellis and Roberts (1981).

$$MGT = \frac{\Sigma\, Dn}{\Sigma n}$$

Where (n) is the number of seeds, which were germinated on day, D is number of days counted from the beginning of germination.

7- The time to get 50 % germination : (T 50 %) was calculated according to the following formula of Coolbear *et al*.,(1984).

$$T\ 50\ \% = ti + \frac{(N/2 - ni)\,(t j - ti)}{nj - ni}$$

Where N is the final number of germination and ni , nj cumulative number of seeds germinated by adjacent counts at times ti and ti when ni < N/2 < nj.

II-Seedling vigor traits :

At the final count, ten normal seedlings from each replicate were randomly taken to measure seedling characters.

1- Seedling length (cm): It was measured of ten normal seedling 14 days after planting, seedlings were dried in hot-air oven at 85 ^{o}C for 12 hours to obtain the seedling dry weight (g).

2- Seedling dry weight (gm): Ten normal seedlings were weighted 14 days after planting according to **Krishnasamy and Seshu (1990).**

3- Seedling Vigor Index (SVI): It was calculated according to on the following equation of **(ISTA rules ,1999).**

Seedling Vigor Index = Seedling length (cm) × Germination percentage.

All obtained data of characters were subjected to the statistical analysis according to the technique of analysis of variance (ANOVA) of completely randomized design, as described by **Gomez and Gomez (1984).**

III-Pathogenic characters :

For the detection of the fungal pathogens, the representative samples of treated seed for the three studied cultivars were tested at Seed Pathology Laboratory, Seed Technology Research Unit, Mansoura. The standard procedures of the International Seed Testing Association (ISTA,1999) was followed using the blotter method. Two hundred seeds were heated in a forced-air at (50 , 60 and 70 ^{o}C) with periods 1,2 and 3 days for each temperature, other two hundred of untreated seed of cultivars under study were placed to serve as control treatment . All seed under study were rinsed three times in distilled water, dried between three layers of filter papers, then placed into four replicates in Petri dish (9 cm diameter, with three papers on the bottom) and incubated at 22±2^{o}C for 7 days under illumination throughout the day. Fungi production was examined under a stereobinocular microscope . The total number of infected seeds by fungus in each dish was recorded and the percentage of infected seeds were then calculated .

RESULTS

Results of germination percentage, seed and seedling vigor traits of the studied rice cultivars as affected by the treatments under study are presented in Table 1. Rice cultivars were significantly varied among them on seed and seedling vigor traits. Giza 178 cultivar gave the highest values of germination percentage (90.2%), speed germination index (42.6), germination energy (89.9), germination rate (0.84), co-efficient of germination (43.5) and the lowest values of mean germination time (4.22 days), time to 50 % germination (2.98 days). Also, the highest values of seedling vigor traits were obtained by Giza 178 cultivar. On contrast , Sakha 104 cultivar gave the lowest speed germination index (32.1), germination rate (0.69) ,co-efficient of germination (34.3), seedling vigor traits and highest mean germination time (5.63 days), time to 50 % germination (5.16 days).

The effect of dry heat temperatures on seed germination , seed and seedling vigor traits was significant as presented in Table 1. Dry heat at 60 ^{o}C produced the highest mean of germination percentage (89.8%) followed by

heating at 50 °C (87.1 %) and the lowest germination % (84.8%)was obtained from the control treatment. A results of enhancing seed vigor with dry heat at 60 °C as compared with control, seedling vigor traits i.e seedling length, seedling dry weight and seedling vigor index of seed reached its highest levels with significant differences at confidence level 5% as compared with the control treatment.

Regarding the effect of heat duration, results in Table 1 demonstrated that heating rice seed for 2 days gave the highest values of seed and seedling vigor. On the other hand, the lowest values of seed germination, seed and seedling vigor were obtained by increasing heating period to 3 days.

Table (1): Effect of rice cultivars , heat temperature and heat duration on rice seed germination , seed and seedling vigor characters.

Characters / Treatments	Germination percentage	Seed vigor						Seedling vigor		
		Speed germination index (SGI)	Germination energy (GE)	Germination rate. (GR)	Co-efficient of germination (CG)	Mean germination time (day)	Time to 50 % germination (day)	Seedling length (cm)	Seedling dry weight (gm).	Seedling vigor index .
A-Cultivars										
Sakha 104	88.0	32.1	87.1	0.69	34.3	5.63	5.16	14.8	0.259	1362.0
Sakha 103	82.7	35.0	81.1	0.72	37.5	5.04	4.18	15.3	0.268	1424.1
Giza 178	90.2	42.6	89.9	0.84	43.5	4.22	2.98	16.3	0.269	1382.0
L.S.D. 5 %	0.5	0.4	0.4	0.01	0.2	0.03	0.03	0.3	0.001	23.5
B-Heat temperatures										
Control	84.8	33.6	84.0	0.70	35.6	5.21	4.52	14.6	0.250	1226.5
50 °C	87.1	35.9	87.4	0.75	37.8	5.16	4.40	15.4	0.262	1345.2
60 °C	89.8	40.3	90.9	0.81	42.2	4.58	3.59	17.1	0.277	1532.1
70 °C	85.9	36.4	85.8	0.73	37.9	4.91	3.92	16.6	0.271	1453.8
L.S.D. 5 %	0.6	0.5	0.5	0.01	0.3	0.04	0.03	0.3	0.001	27.0
C-Heat duration										
1 day	87.2	37.2	87.9	0.77	38.9	4.99	4.05	15.6	0.266	1446.0
2 days	90.2	37.7	88.1	0.77	38.8	4.86	4.03	16.2	0.272	1463.4
3 days	83.5	34.8	84.1	0.71	37.4	5.03	4.24	15.3	0.256	1258.7
L.S.D. 5 %	0.5	0.4	0.4	0.01	0.2	0.04	0.03	0.3	0.001	23.5

Interactions effect between rice cultivars, heating temperatures and heating duration on germination %, speed germination index and seedling dry weight (g) are shown in Fig.1. Heating of Giza 178 seed at 60 °C for two days gave the highest values of germination %, speed germination index and seedling dry weight (g).There is no significant differences of germination % character between heating seed of Giza 178 and Sakha 104 cultivars at 60 °C for two days. The lowest values of germination % was obtained by heating

seed of Sakha 103 at 70 ^{o}C at three days. The lowest speed germination index and seedling dry weight (g) were obtained by heating seed of Sakha 104 rice cultivar at 70 ^{o}C for three days. There is no significant differences of seedling dry weight character between heating seed of Sakha 104 and Sakha 103 rice cultivars at 70 ^{o}C for two days.

Effect of dry heat treatments on percentage of infection by seed-borne fungi of seed cultivars (Sakha 104, Sakha 103 and Giza 178) are presented in Tables 2, 3 and 4. The study gave evidence to the presence of 11 fungal species among the tested cultivars. The fungi *A. padwickii* , *B. oryzae, F. graminearum* were found in a highest rate on all cultivars compared with control, while other fungi were found in a considerable rate. Heating at 50 ^{o}C for 1 and 2 days had a little effect on the frequency of most fungi, extending the heat treatment to 3 days at this temperature reduced the observed level of fungi. The percentage of seeds with fungi decreased with increasing dry heat time, especially as incubation temperature increased. At 60^{o}C for (1,2 and 3 days) there was a decrease in *A. padwickii, B. oryzae, F. graminearum* and *F. moniliforme* with seed of all studied cultivars. However, the reduction in recovery at 50 ^{o}C tended to slow effect compared to 60 ^{o}C and 70 ^{o}C in all durations of all cultivars. Generally, heat treatment at 60 ^{o}C for two days was more effective in reducing these fungal pathogens from rice seed.

Impact of heat treatments at 50 , 60 and 70 ^{o}C for 1, 2 and 3 days on occurrence (%) of total fungi associated of Sakha 104 , Sakha 103 and Giza 178 rice cultivars are shown in Fig. 2,3 and 4. Seed of Sakha 104 cultivar show susceptible to injury with fungi as compared with other two cultivars. While, Giza 178 cultivar seed recorded the lowest % fungi occurrence.

Table (2): Effect of dry heat treatments on fungi percentage with seeds of Sakha 104 rice cultivar.

Fungi	Control	50 ^{o}C			60 ^{o}C			70 ^{o}C		
		1day	2days	3days	1day	2days	3days	1day	2days	3days
A. longissima	7	7	7	6	7	5	1	4	3	0
A. padwickii	15	14	11	8	12	10	6	9	7	4
A.tenuis	10	9	8	5	9	7	3	8	4	2
B. oryzae	16	15	13	12	13	11	10	13	13	8
F. graminearum	14	8	8	7	8	7	5	3	2	0
F. moniliforme	5	2	2	1	0	0	0	0	0	0
F. semitectum	8	6.8	5	4	6	3	3	1	0	0
Helminthosporium sp	9	5	2	2	2	2	2	1	0	0
R. solani	4	2	1	1	2	1	1	0	0	0
S. oryzae	5.3	4	2.8	1	4	2	1	4	1	1
S. botryosum	6	2.8	2	0	1	0	0	0	0	0

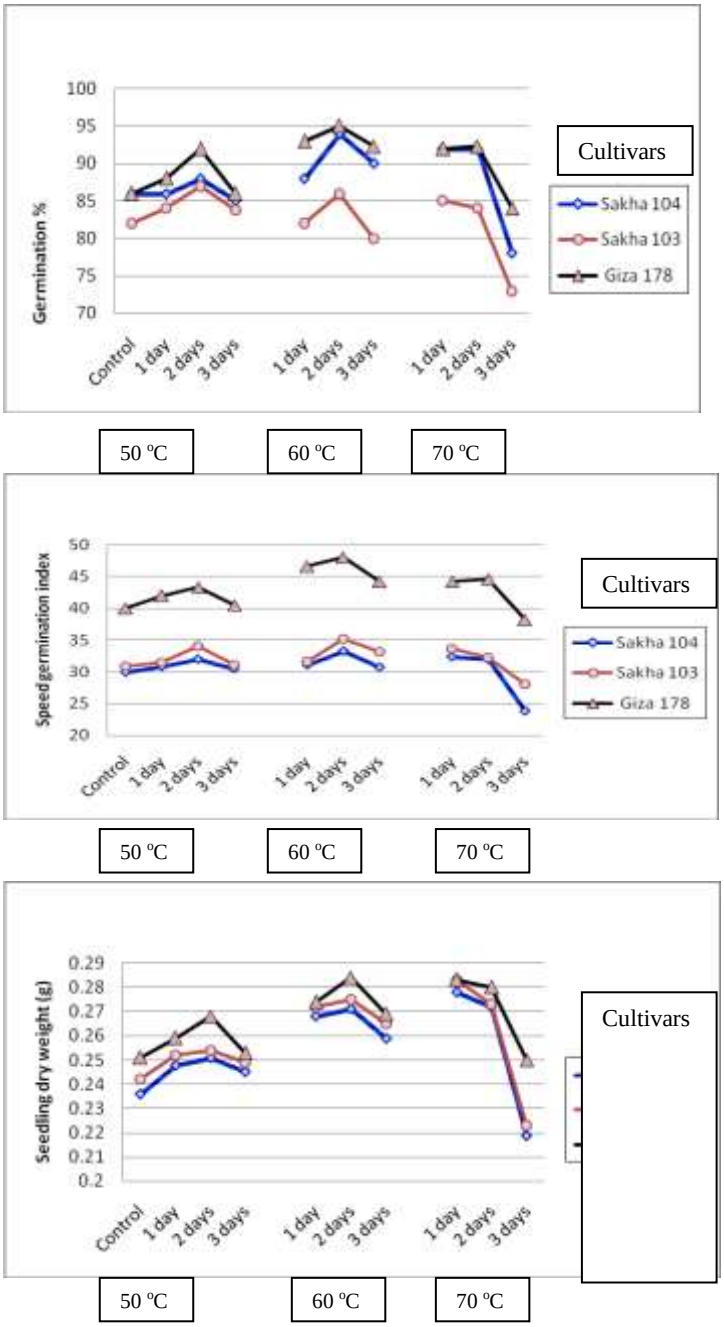

Fig.1: Effect of interactions between dry heat temperatures, duration heat and cultivars on germination %, speed germination index and seedling dry weight (g) of treated rice seeds.

Table (3): Effect of dry heat treatments on fungi percentage with seeds of Sakha 103 rice cultivar.

Fungi	Control	50 °C			60 °C			70 °C		
		1day	2days	3days	1day	2days	3days	1day	2days	3days
A. longissima	3	3	2	0	0	0	0	0	0	0
A. padwickii	12	12	10	10	9	7	5	7	5	0
A.tenuis	11	9	6	5	2	1	0	0	0	0
B. oryzae	11.3	11	10	7	7	5	2	2	2	0
F. graminearum	9	9	9	6	3	1	0	0	0	0
F. moniliforme	5	5	3	0	0	0	0	0	0	0
F. semitectum	4	2	1	0	0	0	0	0	0	0
Helminthosporium sp	6	3	2	0	0	0	0	0	0	0
R. solani	3	2	0	0	0	0	0	0	0	0
S. oryzae	0	0	0	0	0	0	0	0	0	0
S. botryosum	0	0	0	0	0	0	0	0	0	0

Table (4): Effect of dry heat treatments on fungi percentage with seeds of Giza 178 rice cultivar

Fungi	Control	50 °C			60 °C			70 °C		
		1day	2days	3days	1day	2days	3days	1day	2days	3days
A. longissima	5.6	5	4	2	0	0	0	0	0	0
A. padwickii	12	11	10	9	10	8	5	6	5	0
A.tenuis	5	5	4	3	3	1	0	0	0	0
B. oryzae	12	7	6	5	8	2	0	2	1	0
F. graminearum	7	5	4	0	0	0	0	0	0	0
F. moniliforme	2	2	1	0	0	0	0	0	0	0
F. semitectum	3	2	2	0	0	0	0	0	0	0
Helminthosporium sp	4	4	3	0	0	0	0	0	0	0
R. solani	4	4	2	0	0	0	0	0	0	0
S. oryzae	2	2	0	0	0	0	0	0	0	0
S. botryosum	2.5	1	0	0	0	0	0	0	0	0

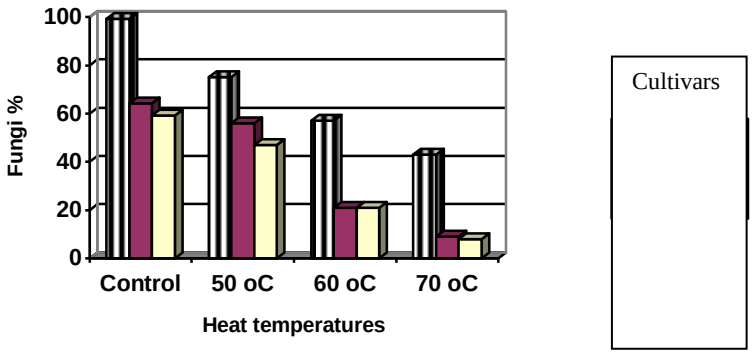

Fig. 2 : Effect of heat treatments for 1 day on occurrence (%) of total fungi associated of three rice cultivars.

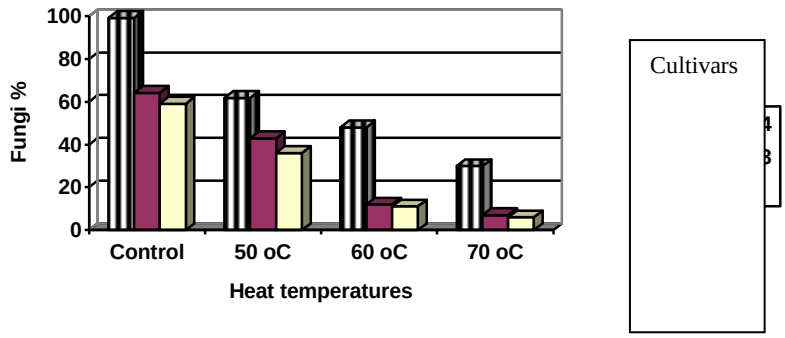

Fig. 3 : Effect of heat treatments for 2 days on occurrence (%) of total fungi associated of three rice cultivars .

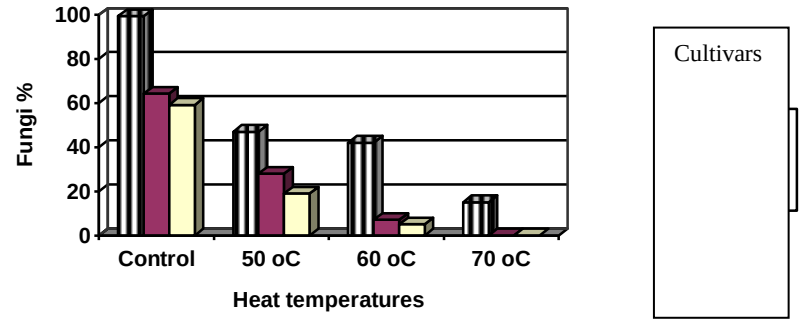

Fig. 4 : Effect of heat treatments for 3 days on occurrence (%) of total fungi associated of three rice cultivars .

Data in Tables (5 and 6) revealed that *Alternaria padwickii, Bipolaris oryzae, Fusarium graminearum, Fusarium semitectum, Rhizoctonia solani, Sarocladium oryzae* as significantly contributing variables to variation in germination % . The prediction equation for germination % was computed as follow :

$$\mathbf{Y= 98.2 -0.79X_1 - 0.79\ X_2 -1.29\ X_3 – 1.28\ X_4 -1.34\ X_5 -1.69\ X_6.}$$

Where ,

Y = Germination %. 98.2 = Constant. X_1 = *A. padwickii.* X_2 = *B. oryzae.* X_3 = *F. graminearum.* X_4 = *F. semitectum.* X_5 = *R. solani*. X_6 = *S.oryzae*

The relative contribution for six fungi of Table (5) towards germination percentage was 99.6 % , while 0.4 % of total germination variation could be attributed to variable removal which was *F. moniliforme* . Simple correlation for the fungi under study and germination % are presented in Table (7). Negative and significant correlation coefficient were recorded between germination % and *A. padwickii , B. oryzae, F. graminearum* which were (-0.897,-0.865 and -0.979) respectively. While

the correlation coefficient between germination % and *F. moniliforme, F. semitectum, R. solani, S.oryzae* was not significant.

Table (5): R, R square and Adjusted R square of contribution fungi towards germination % according to stepwise regression analysis.

R	R square	Adjusted R square	Std. Error of the Estimate
1.000 [a]	0.999	0.996	0.220

Predictors : (Constant), *A. padwickii, B. oryzae, F. graminearum, F. semitectum, R. solani, S. oryzae.*

Table (6): Accepted and removed variables affected germination % according of to stepwise regression analysis.

Accepted variables	Unstandardized Coefficients	Sandaraized Coefficients	Removed variables
	B Std. Error	B Std. Error	
Constant	98.2	0.851	
A. padwickii	-0.79	0.141	
B. oryzae	-0.79	0.124	***F. moniliforme***
F. graminearum	-1.29	0.078	
F. semitectum	-1.28	0.548	
R. solani	-1.34	0.522	
S. oryzae	-1.69	0.518	

Table (7): Simple correlation coefficient (R) for germination and some fungi under study.

Fungi	*A. padwickii*	*B. oryzae*	*F.graminearum*	*F.moniliforme*	*F. semitectum*	*R. solani*	*S. oryzae*
Germination %	-0.897 **	-0.865 **	-0.979 **	-0.625	-0.616	-0.625	-0.605

DISCUSSION

Differences in germination rate among cultivars were observed by Krishnasamy and Seshu (1990). From Table 1, Giza 178 cultivar showed superiority over Sakha 103 and Sakha 104 cultivars of seed and seedlings characters. These results agree with (Sedeek, 2001) who reported that Giza 178 was the best of shoot and root length as compared with sakha 103 and Sakha 104 cultivars. Varietal differences in seed germination and seedling vigor were closely related to ecotype , hull , pericarp and endosperm characters (Lee *et al*., 2002). Giza 178 cultivar derived from a cross between japonica and indica which named (Tongil ecotype) but Sakha 104 and Sakha

103 (japonica ecotype). Germinability differed between the ecotypes Japonica and Tongil, Lee *et al*., 2002 .Japonica rice cultivars showed poorer longevity than indica rice cultivars (Ellis, Hong and Roberts, 1992). Indica rice presented stronger seed vigor during the germination stage than japonica rice(Zhou-fei *et al*.,2010). Also, indicators of reduction seed vigor as decreasing speed germination index and increasing mean germination time were noticed from Sakha 104 cultivar without heating (control), it may be due to highest frequency of *B. oryzae* which was observed on Sakha 104 rice seed cultivar without heating as shown in Table (5) .

With respect to cultivars performance with dry heat treatments, the critical temperature of heating differed between Tongil and Japonica . All Tongil ecotypes were included into the desiccation tolerant group , while Japonica ecotypes were sensitive (Lee *et al*., 2002).

These results were similar with Farooq *et al.*, (2004) who demonstrated that pre-sowing temperature treatments have a significant effect on germination and seedling vigor of rice. While, high temperature in dry heat treatment reduces seed viability and seedling vigor (Lee *et al*.,2002) .The useful effect of dry heat may be due to the increase in total sugar contents and the α-amylase activity which was positively correlated with germination rate (Basra *et al.* 2004). While, the negative effect of high temperature in dry heat treatment possibly occurred because of the harmful effect on embryo and because of the extra time required by the very dry seeds to imbibe enough moisture for germination (Clear *et al*., 2002).

Transmission of fungal diseases through rice seeds is important because seed transmission ensures the presence of pathogen with host. Seed borne disease inoculums may be spread through out the field, the presence of pathogen with the seed causes the earliest possible infection of seedling. Transmission of fungal diseases from infected seed may bring more virulent and new races of a dangerous fungal pathogen such as *Manaporthe grisea* to an infected and uninfected soil. This especially important if infected seed has failed to become established and a second sowing is made (Neergaard, 1970 and 1979). Dry heat can eliminate some seed-borne diseases, heating at 50 ^{o}C for 1 day had a little effect on the frequency of most fungi .While the heat treatment 60 ^{o}C for 2 days reduced level of Fusarium genus caused seed rot/seedling mortality. Alternaria genus was eradicated from seed heated at 70 ^{o}C to 3 days except Sakha 104 rice cultivar. Reduction in seed viability which was resulted from fungi infected exhibit pre or post emergence death of seedling (Duraiswamy and Mariappan,1983).*B. oryzae* started to decline after 60 ^{o}C for 2 days of heating. However, the extra 2 days of incubation time confirmed that the fungi were not just delayed in their growth but were dead. Fungal death may be due to thermal stress or desiccation, or both. These results were confirmed with Agarwal and Sinclair(1987) as well as Clear *et al*., (2002).

Safe elimination of *A. padwickii* , *B. oryzae*, *F. graminearum* and *F. moniliforme* requires a different treatment regime from that used in this study and may require a suitable exposure to 60 or 70 ^{o}C to give the highest germination characters. Reduction or eradication of competing fungi also

could lead to trails that offer a better assessment of the effects of these pathogens on seed and seed to seedling transmission.

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تأثير بعض المعاملات الحرارية على حيوية وصحة التقاوي لبعض أصناف الأرز

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أجريت تجربة معملية بمعمل قسم بحوث تكنولوجيا البذور بالمنصورة خلال عام 2012 م بالتصميم التام العشوائية في أربع مكررات لدراسة تأثير معاملة تقاوي أصناف الأرز (سخا 103 ، سخا 104 و جيزة 178) بدرجات تجفيف حراري (50، 60 و 70° م و تقاوي غير معاملة) لمدد (1، 2 و 3 يوم) على إنبات البذور ، قوة البادرات و الصفات المرضية للتقاوي ويمكن تلخيص أهم النتائج فيما يلي :-

سجل صنف الأرز جيزة 178 أعلى القراءات لصفات حيوية التقاوي و البادرات مقارنة بالصنفين سخا 103 و سخا 104.

أظهر التجفيف الحراري على درجة حرارة 60°م لمدة 2 يوم ارتفاع النسبة المئوية للإنبات وصفات حيوية التقاوي والتي تم قياسها بواسطة (دليل سرعه الإنبات , طاقه الإنبات , معدل الإنبات , معامل الإنبات ، متوسط زمن الإنبات و الزمن اللازم لإنبات 50% من البذور) وقوة البادرات والتي تم قياسها بواسطة (طول البادرة , الوزن الجاف للبادرة ودليل قوة البادرات) مقارنة بالكنترول وذلك في تقاوي جميع الأصناف تحت الدراسة .

أوضحت النتائج أن التجفيف الحراري لتقاوي جميع الأصناف تحت الدراسة على درجة حرارة 70°م لمدة 3 يوم سجل أقل القراءات لصفات حيوية التقاوي وقوة البادرات.

سجل التفاعل الثلاثي بين الأصناف ، درجات الحرارة و فترات التعريض تأثيرا معنويا حيث أظهرت معاملة تقاوي صنف الأرزجيزة 178 بالهواء الساخن على درجة حرارة 60°م لمدة 2 يوم أعلى القراءات لصفات نسبة الإنبات، سرعة الإنبات و الوزن الجاف للبادرات .

اشارت النتائج إلى أن التجفيف الحراري على درجة حرارة 60°م لمدة 2 يوم عمل على خفض الإصابة بفطريات ألترناريا بادويكي ، ألترناريا تينس و بيبولاريس أوريزا وذلك في تقاوي جميع الأصناف تحت الدراسة ،كما لم يلاحظ أي تواجد لفطريات فيوزاريوم مونيليفورم ، فيوزاريوم سيميتكتم ، هلمينسوسبوريوم ، وريزوكتونيا سولاني ، ساروكلاديوم أوريزا و ستيمفيلم بوتريوسم وذلك في تقاوي صنفي الأرز سخا 103 وجيزة 178 عند نفس المعاملة.

أظهرت نتائج تحليل الانحدار المتعدد المرحلي أن فطريات ألترناريا بادويكي ، ، فيوزاريوم جراميئيرم ، فيوزاريوم سيميتكتم وريزوكتونيا سولاني و ساروكلاديوم أوريزا تعتبر اكثر الفطريات تأثيرا في صفة نسبة الإنبات في حين أن فطر فيوزاريوم مونيليفورم لم يكن مؤثرا على هذه الصفة ، كذلك أظهر تحليل الارتباط البسيط أن فطريات ألترناريا بادويكي ، بيبولاريس أوريزا ، فيوزاريوم جراميئيرم كان لها ارتباط معنوي سالب مع صفة نسبة الإنبات في حين أن باقي الفطريات كان لها ارتباط سالب مع نسبة الانبات ولكنه ارتباط غير معنوي ولذلك توصي الدراسة بأهمية تلك الفطريات وتأثيرها على صفة نسبة الانبات وحيوية تقاوي الأرز

لذلك توصي هذه الدراسة بإمكانية معاملة تقاوي الأرز للأصناف تحت الدراسة بالمعاملة الحرارية (60 °م لمدة 2 يوم) لتحسين الإنبات ومقاومة الفطريات المحمولة على البذرة دون حدوث أي تأثيرات عكسية على حيوية التقاوي .

قام بتحكيم البحث

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