RESULTS

Isolation of wood deterioration fungi:

Wood samples showing different deterioration and discoloration symptoms collected from different localities were used in isolation trials, which resulted in 14 isolates belonging to 4 fungal genera. These were 4 isolates of *Trichoderma album*; 3 isolates of each of *Aspergillus flavus*; and *Aspergillus glaucus*; one isolate of each of *Botryodiplodia theobromae*, *Penicillium chermesinum*. *Trichoderma glucum*, and *Trichoderma koningi*.

Infestation test:

The ability of the isolated fungi for attacking wooden materials was investigated. The obtained photographes **(Fig.2 a, b, c & d)** indicate that all isolated fungi could grow with different extents on inoculated toothpicks. The most extensive fungal growth on toothpicks was produced by *Botryodiplodia theobromae* followed by *Trichoderma koningi*, *Aspergillus glaucus* and *Trichoderma album*.

Anatomy of inoculated wood:

In addition to superficial mycelial growths which were observed on the outer surfaces of the inoculated wooden toothpicks, the obtained data indicated that all tested fungi could colonize the wooden toothpicks internally. In cross section made in inoculated toothpicks "in Fig. 3 a, b, c, d, and f", the fungal hyphae were noticed across the internal wood cells. Fungal spores as well as mycelial fragments were also observed inside cavities of deteriorated wood cells.

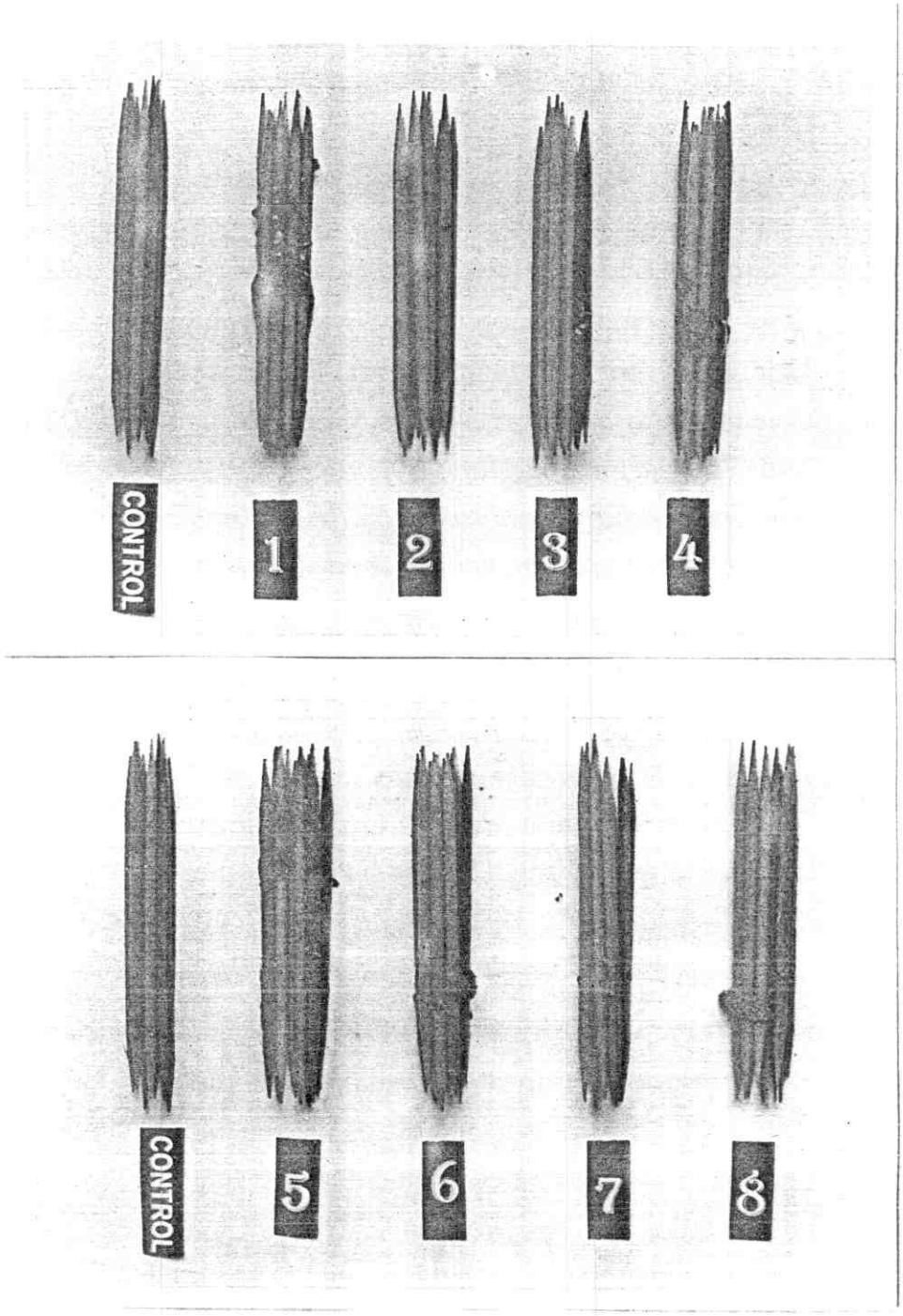


Fig. (2): Fungal growth on inoculated toothpicks (1= *B. theopromae*; 2= *T. album* isolate 1; 3= *P. chermesinum*; 4= *T. glucum*; 5= *T. album* isolate 2; 6= *A. glaucus* isolate 1; 7= *A. flavus* isolate 1; and 8= *A. glaucus* isolate 2).

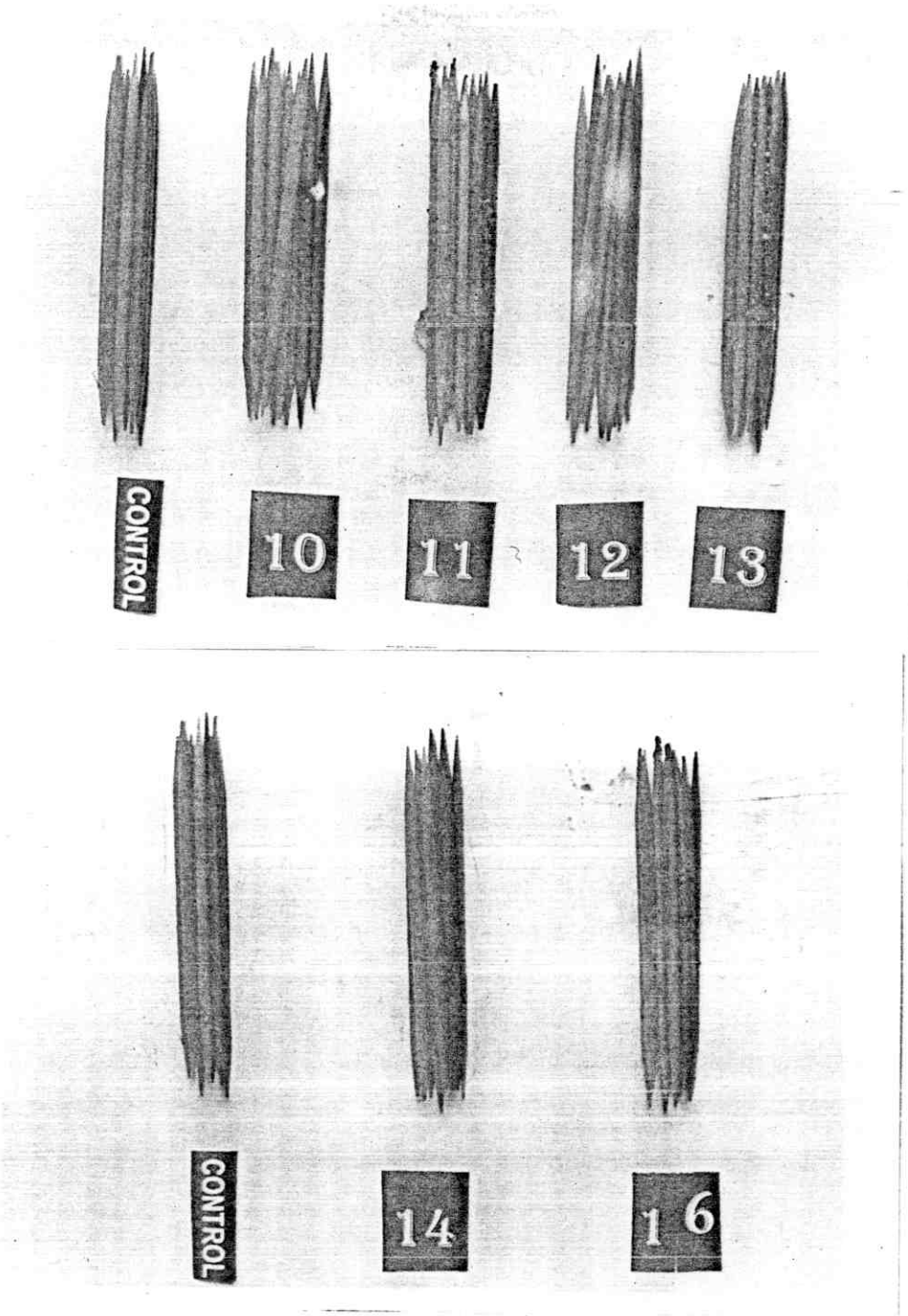


Fig. (2 continued): Fungal growth on inoculated toothpicks (10= *T. album* isolate 3; 11= *T. konongi*; 12= *A. flavus* isolate 2; 13= *T. album* isolate 4; 14= *A. glaucus* isolate 3; and 16= *T. album* isolate).

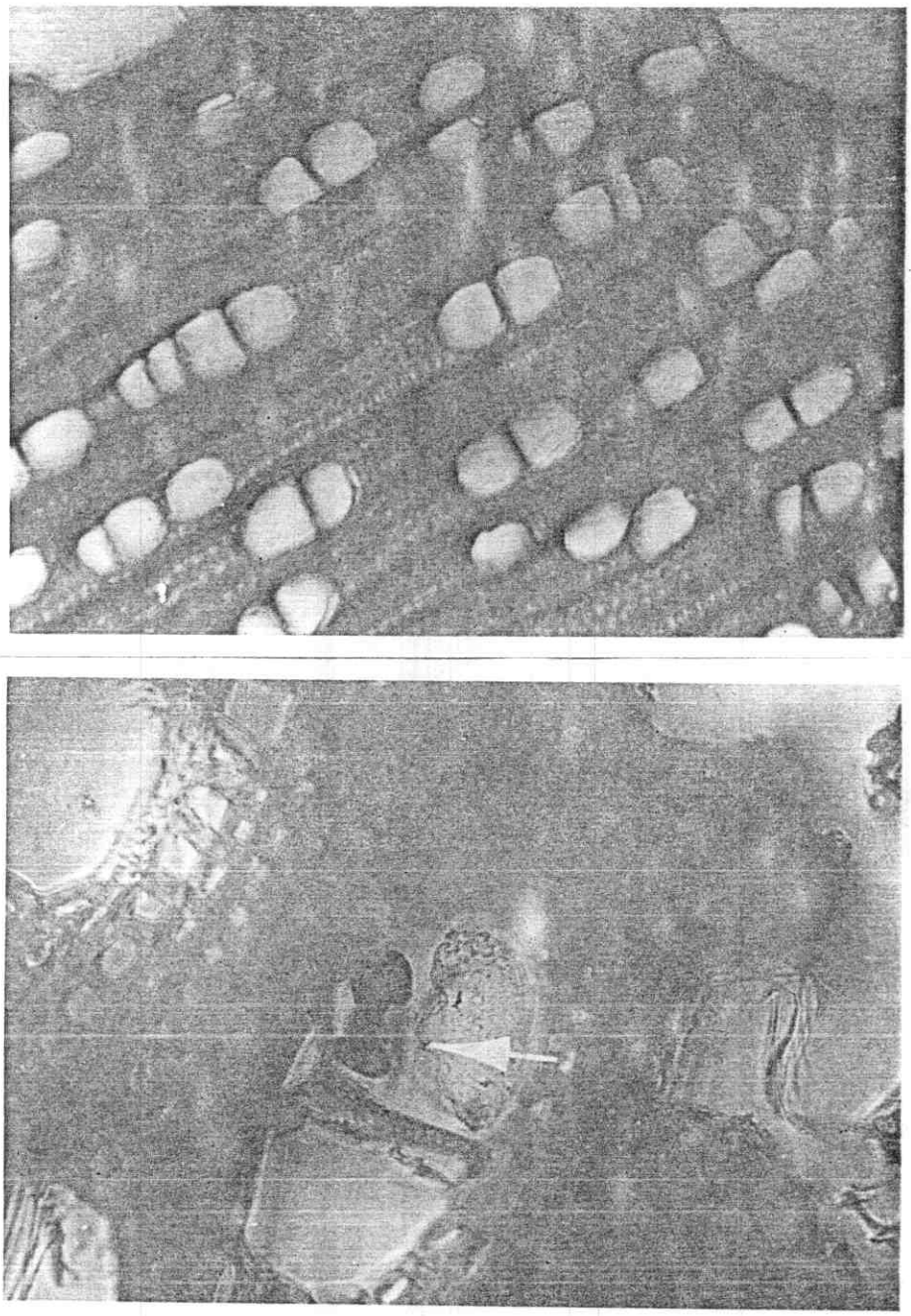


Fig. (3): Cross section in healthy control wooden toothpick (above) and the one inoculated with *B. theibromae* (below). The charactrized spores and may be mycelia are seen inside cavities of wood cells.

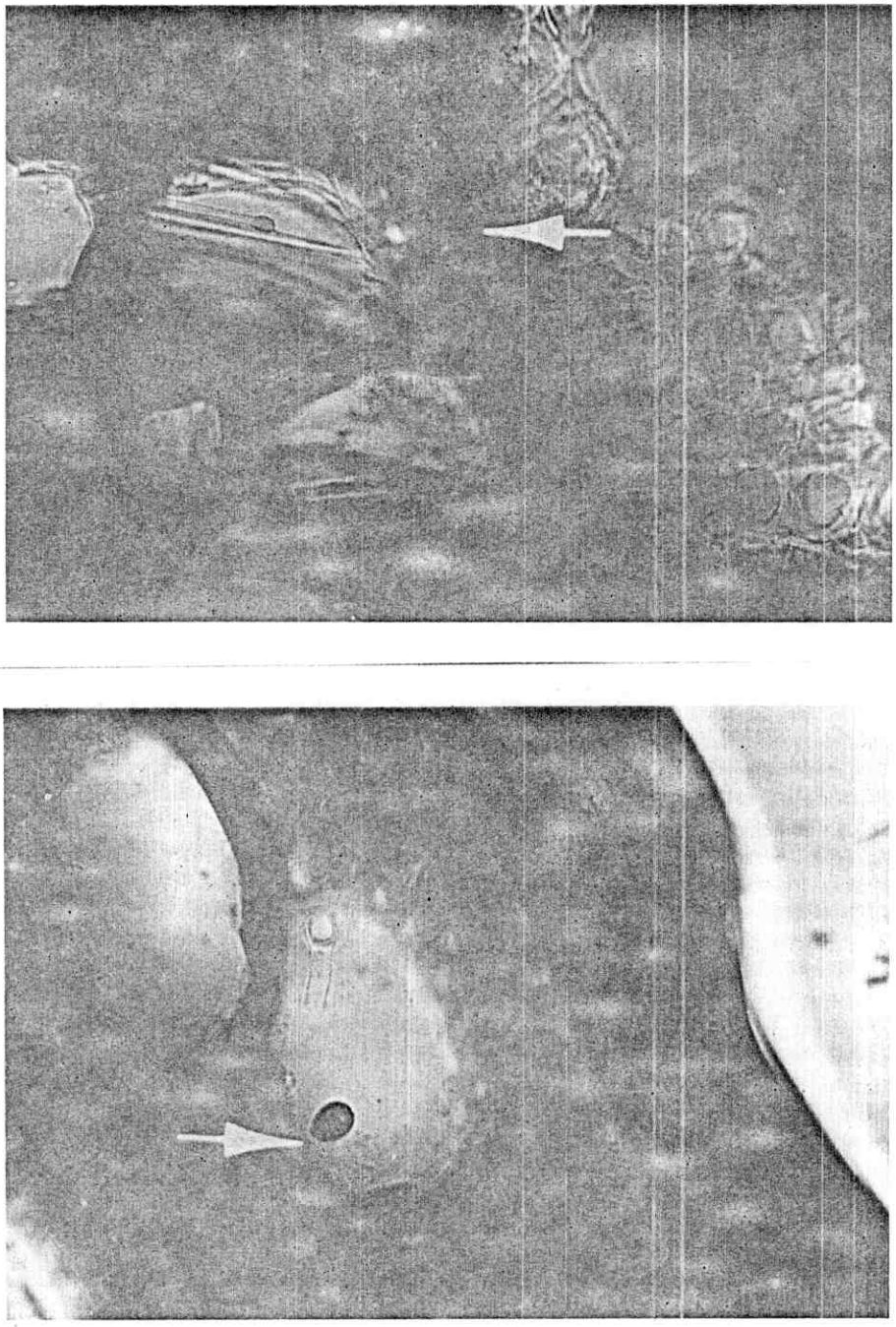


Fig. (3 continued): Cross section in wooden toothpick inoculated with *A. glaucus* (above) and *T. album* (below). See the charactrized spores and may be mycelia inside cavities of wood cells.

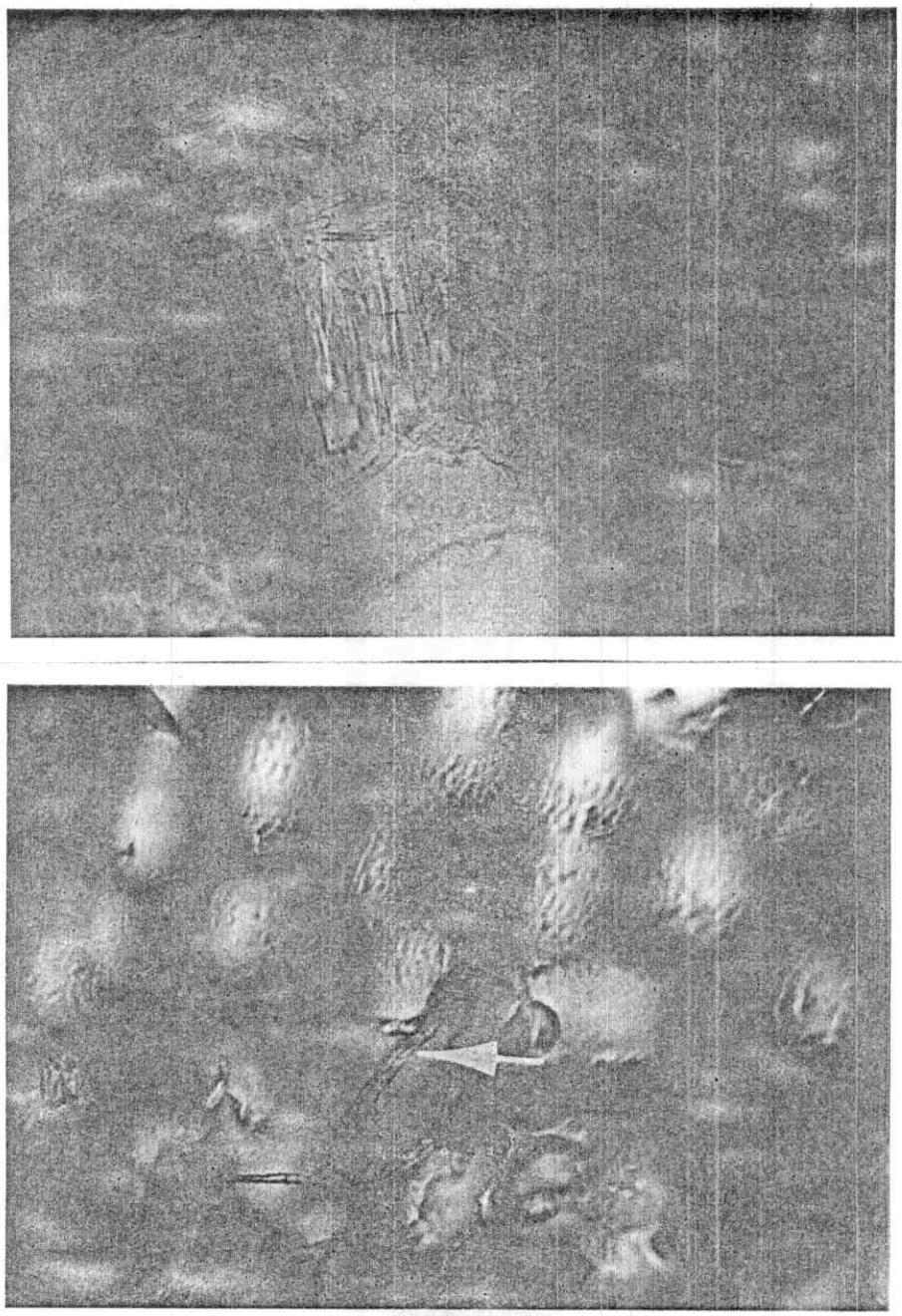


Fig. (3 continued): Cross section in wooden toothpick inoculated with *T. album* (above) and *T. koningi* (below). See the charactrized spores and may be mycelia inside cavities of wood cells.

Effect of the isolated fungi on colour and weight of some wood kinds:

In this study, a known weight of some different wood kinds namely Kafur, Casuarina, Abal, Zanzalakht, Tut, Sunt, and Sarw were used. Each kind of wood was inoculated with *B. theobromae*, *T. koningi*, *T. album*, or *A. glaucus*, then incubated at 25°C for 4 weeks. After the incubation period, inoculated wood samples were examined and described for superficial growth of the inoculated fungi. The wet weights of inoculated wood samples were recorded, then carefully washed with tap water for removing the surface fungal growths, dried at 105°C for 24 h and weighed again.

1 – Effect on colour of the inoculated woods:

All tested fungi could superficial grow, to different extent, on more than one kind of the inoculated woods (**Fig. 4**). The fungus *B. theobromae* superficial could grow and produced extensive blackish discoloration on the seven tested wood kinds. However, *T. album*, *A. glaucus* and *T. koning* produced noticible superficial growth with different colours on more than one kind of the inoculated woods. Superficial growth of the latter three fungi tend to be greenish, grayish or yellowish according to kind of inoculated woods. Conspicuous staining and discoloration were noticed on most inoculated wood kinds especially those inoculated with *B. theobromae*.

2 - Effect on the wet-weight of the inoculated wood:

Data in **Tables (5 and 6)** declare that the wet weight of wood inoculated with the tested wood deteriorating fungi was increased by different extents. Percentages of increase in wet weight were greatly varied and dependent upon kind of wood and the tested fungus. Woods of Kafur and Casuarina inoculated with *A. glaucus* produced the highest (53.77%) and lowest (4.62%) increase in wet weight of these wood kinds, respectively. With respect to kind of wood, the highest and lowest increase in wet weight of wood were caused in order by *A. glaucus* (53.77%) and *T. album* (16.07%) on Kafur; *T. album* (42.92%) and *A. glaucus* (4.62%) on Casuarina; *T. koningi* (38.26%) and *A. glaucus* (9.42%) on Abal; *T. koningi* (23.65%) and *B. theobromae* (7.31%) on Zanzalakht; *T. album* (42.83%) and *T. koningi* (5.28%) on Tut; *T. album* (34.92%) and *T. koningi* (17.14%) on Sunt and *A. glaucus* (32.27%) and *T. koningi* (16.32%).

Wood of Kafur regardless fungi, exhibited the highest increse in wet weight (30.288%) followed by Sunt (26.985%), and Sarw (24.355%), meanwhile the lowest increases were in Zanzalakht (16.825%) and Tut (20.153%). However, *T. album* caused the highest increase in wet weight with an average of 26.687% followed by *A. glaucus* (24.971%), *B. theobromae* (21.495%) and *T. koningi* (19.473%).

Table (5): Wet-weight of different kinds of wood (in g) as affected by 4 wood deteriorating fungi compared with their controls after 4 weeks from inoculation (all treatments started with a known oven dry weight = 50 g).

Wood kind	Wet weight (in g) of woods inoculated by					Mean
	Control	*Botrydiphodia theobromae*	*Trichoderma koningi*	*Aspergillus glaucus*	*Trichoderma album*	
Kafur	61.0 *	75.5	77.8	93.8	70.8	79.48
Casuarina	65.0	84.5	69.7	68.0	92.9	76.02
Abal	69.0	88.5	95.4	75.5	77.4	81.16
Zanzalakht	52.0	55.8	64.3	60.8	62.1	59.00
Tut	60.0	65.3	68.8	74.2	85.7	70.80
Sunt	63.0	76.7	73.8	84.5	85.0	76.60
Sarw	66.0	85.9	76.9	87.3	78.2	78.86
Mean	62.50	76.03	75.24	77.73	78.87	

* Each figure is the mean of three replicates

L.S.D. at 5% for:	Fungi (F)	Wood kind (W)	F x W
	0.71	0.84	1.88

Table (6): Increase percentage in wood wet weight as affected by inoculation with 4 wood deteriorating fungi after 4 weeks from incubation. (Data were drived from Table 5).

Wood kind	Increase% in wet weight of woods inoculated by				Mean
	Botrydiplodia theobromae	*Trichoderma koningi*	*Aspergillus glaucus*	*Trichoderma album*	
Kafur	23.77	27.54	53.77	16.07	30.288
Casuarina	30.00	7.23	4.62	42.92	21.193
Abal	28.66	38.26	9.42	12.17	22.128
Zanzalakht	7.31	23.65	16.92	19.42	16.825
Tut	8.83	5.28	23.67	42.83	20.153
Sunt	21.75	17.14	34.13	34.92	26.985
Sarw	30.15	16.52	32.27	18.48	24.355
Mean	21.495	19.374	24.971	26.687	

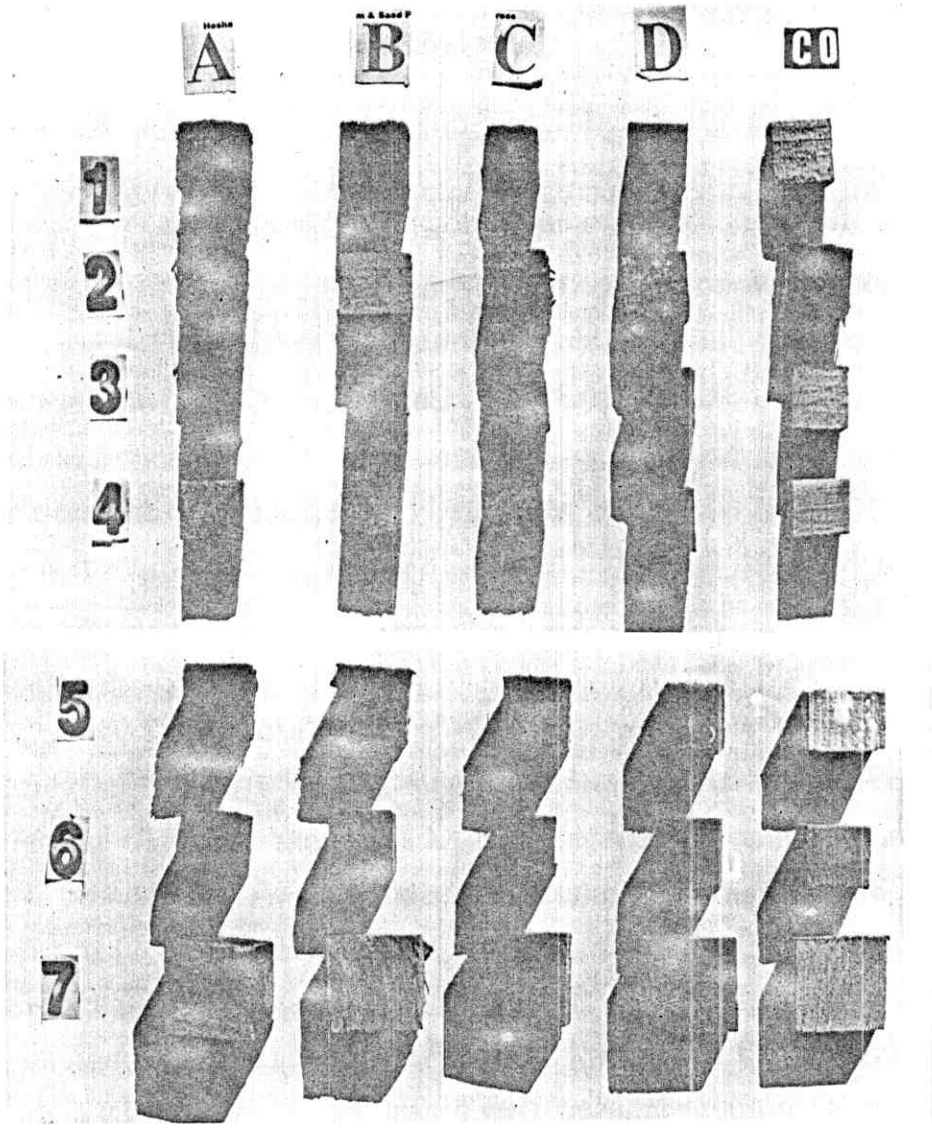


Fig. (4): Effect of different isolated fungi *i.e. B. theobromae* (A); *T. koningi* (B); *A. glaucus* (C) and *T. album* (D) on seven wood kinds i.e. (1) Zanzalakht, (2) Tut, (3) Sunt, (4) Abal; (5) Casuarina; (6) Kafur; and (7) Sarw. See wood descolaration and growth of fungi on the inoculated woods compared with their controls (CO).

3 - Effect on wood dry weight of the inoculated woods:

Data in **Tables (7 and 8)** prove that the dry weight of wood was greatly reduced due to its inoculation with the different tested wood deteriorating fungi. Loss in dry weight of woods was ranged between 7.56-45.68% according to kind of wood and the tested fungus. The highest loss was in wood of Tut (44.88%) followed in order by Zanzalakht (41.66%); Abal (29.38%); Casuarina (26.01%); Sarw (20.61%); Kafur (19.42%) and Sunt (17.49%). For a givin kind of wood, % loss was greatly varied and may dependent on kind of the tested fungus. In this regard, the highest and lowest % losses were produced in order by *T. album* (14.26%) and *T. koningi* (9.70%) on Kafur; *A. glaucus* (40.88%) and *T. album* (9.14%) on Casuarina; *T. koningi* (39.04%) and *B. theobromae* (10.86%) on Abal; *B. theobromae* (40.68%) and *A. glaucus* and *T. album* (38.56%) on Zanzalakht; *A. glaucus* (45.68%) and *T. koningi* (40.86%) on Tut; *B. theobromae* (13.26%) and *T. koningi* (7.56%) on Sunt and *T. koningi* (14.58%) and *A. glaucus* (12.50%) on Sarw. The same data clearly indicate that *A. glaucus* caused the higest loss in wood dry weight (26.12%) followed by *T. koningi* ((24.59%); *T. album* (21.37%) and *B. theobromae* (20.38%).

From the above results, it could be concluded that Sunt and Kafur woods, based on % loss in dry weight, were more resistant against wood deteriorating fungi, meanwhile

Zanzalakht and Tut woods were the most susceptible. In this respect, woods of Sarw, Casuarina and Abal were intermediat.

Table (7): Dry weight of different kinds of woods (in g) as affected by 4 wood deteriorating fungi compared with their controls after 4 weeks from inoculation (all treatments started with a known oven dry weight =50 g).

Wood kind	Dry weight (in g) of woods inoculated by					Mean
	Control	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	
Kafur	50.0*	44.05	45.15	44.39	42.87	45.29
Casuarina	50.0	44.93	40.05	29.56	45.43	41.99
Abal	50.0	44.57	30.48	37.17	39.34	40.31
Zanzalakht	50.0	29.66	29.75	30.72	30.72	34.17
Tut	50.0	28.38	29.57	27.16	27.68	32.56
Sunt	50.0	43.37	46.22	45.82	45.87	46.26
Sarw	50.0	43.70	42.71	43.75	43.31	44.69
Mean	50.0	39.81	37.70	36.94	39.32	40.75

* Each figure is the mean of three replicates

L.S.D. at 5% for:	Fungi (F)	Wood kind (W)	F x W
	0.89	0.96	2.10

Table (8): Loss percentage in wood dry weight as affected by inoculation with 4 wood deteriorating fungi after 4 weeks.

Wood kind	Tested Fungi				Mean
	Botryodiphodia theobromae	*Trichoderma koningi*	*Aspergillus glaucus*	*Trichoderma album*	
Kafur	11.90	9.70	11.22	14.26	19.42
Casuarina	10.14	19.90	40.88	9.14	26.01
Abal	10.86	39.04	25.66	21.32	29.38
Zanzalakht	40.68	40.50	38.56	38.56	41.66
Tut	43.24	40.86	45.68	44.64	44.88
Sunt	13.26	7.56	8.36	8.26	17.49
Sarw	12.60	14.58	12.50	13.38	20.61
Mean	20.38	24.59	26.12	21.37	28.49

Chemical analysis of ethanolic extract of inoculated woods:

1- Sugar content:

Data in **Table (9)** illustrate that reducing, non-reducing and total sugar contents were greatly varied in both non-inoculated and inoculated woods of different kinds. As for reducing sugars (mg/g dry weight), non-inoculated wood of Tut was found to be contained the highest amount (29.89) followed by woods of Abal (21.88), Sarw (15.03), Zanzalaht

(14.88), Sunt (8.23), Kafur (7.48), and Casuarina (6.15), respectively. In woods inoculated with wood deteriorating fungi, the highest amounts of reducing sugars were recorded in the following "wood-fungus" combinations: Tut-*B. theobromae* (53.54), Sunt-*T. album* (38.41), Sunt-*T. koningi* (33.78), and Sunt-*A. glaucus* (29.70). Meanwhile, Casuarina-*B. theobromae* showed the lowest amounts of reducing sugars (9.14) followed by Casuarina-*A. glaucus* (11.84), Sarw-*T. koningi* (13.65), and Abal-*T. album* (14.83), respectively.

Regarding with non-reducing sugars in non-inoculated woods, the highest amounts of non-reducing sugars were recorded in woods of Tut (7.84) followed by Zanzalakht (7.07), Sunt (6.77), Casuarina (6.76), Kafur (6.22), Abal (3.84) and Sarw (2.51), respectively. Non-reducing sugars were greatly increased, in general, in inoculated woods. Concerning with the tested fungi, the highest increase induced by *B. theobromae*, T. coningi, *A. glaucus*, and *T. album* were detected in woods of Sarw (22.54), Sunt (32.20), Abal (17.50) and Sunt (20.92), respectively. The lowest increases caused by these fungi were detected in woods of Casuarina (8.42), Zanzalakht (8.95), Sarw (5.51), and Sarw, respectively. However, non-reducing sugars in woods of Casuarina (2.77) and Abal (2.24) inoculated with *T. album* were lower than control status of these woods i.e. 6.76 and 3.84, respectively.

Table (9): Sugar contents (in mg) in different kinds of wood as affected by inoculation with *B. theobromae*, *T. koningi*, *A. glaucus*, and *T. album*, the tested wood deteriorating fungi.

Treatments	Different kinds of tested woods							Means
	Tut	Abal	Sarw	Kafur	Zanzalakht	Casuarina	Sunt	
Non-reducing sugars								
Control	7.84	3.84	2.51	6.22	7.07	6.76	6.77	05.86
B. theobromae	17.90	10.60	22.54	10.60	18.05	8.42	13.57	14.53
T. koningi	15.82	25.88	21.32	13.71	8.95	14.31	32.20	18.88
A. glaucus	11.10	17.50	5.51	12.87	7.08	16.36	13.89	12.04
T. album	20.85	2.24	9.43	14.52	9.48	2.77	20.92	11.46
Reducing sugars								
Control	29.89	21.88	15.03	7.48	14.88	6.15	8.23	14.79
B. theobromae	53.54	25.49	19.00	14.21	21.20	9.14	17.01	22.80
T. koningi	29.32	15.51	13.65	18.33	22.25	17.65	33.78	21.50
A. glaucus	23.13	27.52	15.99	14.83	23.45	11.84	29.70	20.92
T. album	27.35	14.83	13.48	26.28	19.74	32.50	38.41	24.66
Total sugars								
Control	37.73	25.72	17.54	15.70	21.95	12.91	15.00	20.94
B. theobromae	71.44	36.09	41.54	24.81	39.25	17.56	30.58	37.32
T. koningi	45.14	41.39	34.97	32.04	31.20	31.96	65.98	40.38
A. glaucus	34.23	45.02	21.50	27.7	30.53	28.20	43.59	32.97
T. album	48.20	17.07	22.91	40.80	29.22	35.27	59.33	36.11

As for total sugars in non-inoculated woods, the highest amounts were recorded in wood of Tut (37.73), followed by Abal (25.72), Zanzalakht (21.95), Sarw (17.54), Kafur (15.70), Sunt (15.0) and Casuarina (12.91),

respectively. In inoculated woods, the highest total sugar content induced by *B. theobromae*, (Tut 71.44), *T. koningi* (Sunt 65.98), *A. glaucus*, (Abal 45.02), and *T. album* (Sunt 59.33), respectively were detected in woods. However the lowest amounts of total sugars induced by these fungi were recorded in woods of Casuarina (17.56), Zanzalakht (31.20), Sarw (21.50), and Abal (17.07), respectively.

2- Phenolic content:

Data in **Table (10)** showe that the amounts of free, conjugated and total phenols determined in non-inoculated woods or woods inoculated with the tested wood-deteriorating fungi were greatly varied and dependent on kind of wood and the fungus involved. In general, they were higher in inoculated woods than in control (non-inoculated) woods. Compared with the non-inoculated woods, and regardless fungi, the free conjugated, and total phenols were increased in listed order by 13.3-2050%, 414.0-956.0%, and 149.6-2555.3% in wood of Tut, 6.2-58.0%, 119.2-863.0%, and 22.8-148.9% in wood of Abal, 10.3-147.4%, 3.6-125.0%, and 23.2-107.6% in wood of Sarw, 120.3-343.1%, 13.1-644.9%, and 92.3-325.0% in wood of Kafur, 50.9-351.3%, 26.2-607.2%, 44.1-428.9% in wood of Zanzalakht, 14.9-171.56%, 26.9-252.0%, 18.0-192.3% in wood of Casuarina and 3.22-58.2% 4.6-131.6%, and 17.8-73.2% in wood of Sunt. The highest increase% in free phenols was associated with wood of Zanzalakht inoculated with *B.*

theobromae, while the highest increases in conjugated, and total phenols were induced by were associated with wood of Tut inoculated with *A. glaucus* and *T. koningi*, respectively. On the other hand, the lowest increase in free phenols were detected in woods of Sunt and Abal inoculated with *T. koningi*, while Sunt and Sarw inoculated with *T. album* showed the lowest increase in conjugated phenol. The lowest increase in total phenol was detected in woods of Sunt and Casuarina inoculated with *A. glaucus* and *T. album*, respectively.

Table (10): Phenolic contents (in mg) in different kinds of wood as affected by inoculation with *B. theobromae*, *T. koningi*, *A. glaucus*, and *T. album*, the tested wood deteriorating fungi.

Treatments	Different kinds of tested woods							Means
	Tut	Abal	Sarw	Kafur	Zanz-alakht	Casu-arina	Sunt	
Free phenols								
Control	47.25	32.97	48.72	43.47	33.31	50.65	98.10	51.35
B. theobromae	144.10	52.08	53.76	192.60	150.32	137.55	155.15	126.51
* % increase	205.0	58.0	10.3	343.1	351.3	171.56	58.2	
T. komimgi	156.66	35.03	57.46	95.76	50.27	62.39	101.26	78.40
% increase	231.6	6.2	17,9	120.3	50.9	23.2	3.22	
A. glaucus	53.55	35.70	57.96	157.40	57.12	87.36	120.12	81.32
% increase	13.3	8.3	19.0	262.1	71.5	72.5	22.4	
T. album	106.26	41.58	120.54	121.80	50.60	58.22	145.35	92.05
% increase	124.9	26.1	147.4	189.2	51.9	14.9	48.2	
Conjugate phenols								
Control	8.13	5.67	17.43	15.33	14.49	17.60	37.72	15.91
B. theobromae	46.30	35.28	30.66	57.30	102.48	61.95	79.62	59.08
% increase	469.5	522.2	75.9	273.8	607.2	252.0	111.1	
T. komimgi	41.79	12.43	24.02	17.34	21.97	24.13	87.36	34.15
% increase	414.0	119.2	37.8	13.10	51.60	37.10	131.60	
A. glaucus	85.85	20.16	39.22	47.35	55.86	38.22	39.90	46.65
% increase	956.0	255.6	125.0	208.9	285.5	117.2	5.80	
T. album	63.84	54.60	16.80	114.20	18.28	22.34	39.45	47.07
% increase	685.2	863.0	3.6	644.9	26.2	26.9	4.60	
Total phenols								
Control	55.86	38.64	66.15	58.80	47.80	68.25	135.82	67.33
B. theobromae	190.40	87.36	84.42	249.90	252.80	199.50	235.20	185.65
% increase	240.9	126.1	27.6	325.0	428.9	192.3	73.2	
T. komimgi	198.45	47.46	81.48	113.10	72.24	86.52	188.62	112.55
% increase	2555.3	22.8	23.2	92.3	51.1	26.8	38.9	
A. glaucus	139.40	55.86	97.18	204.75	112.98	125.58	160.02	127.97
% increase	149.6	44.6	46.9	248.2	136.4	84.0	17.8	
T. album	170.10	96.18	137.34	236.00	68.88	80.56	184.80	137.69
% increase	204.5	148.9	107.6	301.4	44.1	18.0	36.1	

$$*\text{increase}\% = \frac{\text{Amount in inoculated wood - Amount in control wood}}{\text{Amount in control wood}} \times 100$$

3- Free nitrogen content:

Data in **Table (11)** indicate that the free nitrogen content (mg/g dry weight) was greatly varied in different kinds of woods. In non-inoculated woods, Kafur was found to be contained the highest amounts of nitrogen (0.673) followed by Sarw (0.651), Tut (0.560), Zanzalakht (0.448), Abal (0.376), Casuarina (0.278), and Sunt (0.202), respectively. Free nitrogen content was relatively higher in inoculated than in non-inoculated woods and this was dependant on kind of wood and wood-deteriorating fungus. The fungi *Botryodiblodia theobromae*, *T. koningi*, *A. glaucus* and *T. album* induced the highest amounts of free nitrogen in woods of Casuarina (1.230), Zanzalakht (1.150), Zanzalakht (1.484), and Sarw (2.121), respectively. However, the lowest amounts of free nitrogen induced by these four fungi were detected in woods of Sunt (0.390), Kafur (0.564), Casuarina (0.579), and Abal (0.535), respectively. Compared with control, the highest average of free nitrogen content was caused by *T. album* (1.136) followed by *A. glaucus* (0.844), *T. koningi* (0.724) and *B. theobromae* (0.685), respectively.

Table (11): Free nitrogen contents (in µg) in different kinds of wood as affected by inoculation with *B. theobromae*, *T. koningi*, *A. glaucus*, and *T. album*, the tested wood deteriorating fungi.

Treatments	Different kinds of tested woods							
	Tut	Abal	Sarw	Kafur	Zanzalakht	Casuarina	Sunt	Means
Control	0.560	0.376	0.651	0.673	0.448	0.278	0.202	0.399
B. theobromae	0.999	0.760	0.709	0.716	0.673	1.230	0.390	0.685
T. koningi	0.658	0.789	1.086	0.564	1.150	0.752	0.796	0.724
A. glaucus	0.963	1.259	1.064	0.767	1.484	0.579	0.637	0.844
T. album	1.295	0.535	2.121	1.310	1.419	1.252	1.158	1.136

Physiological studies:

1- Effect of different wood extracts on the linear growth:

Data in **Table (12)** indicate that the linear growth of the isolated fungi was affected differently by the investigated wood extracts. In this regard, extract from wood of Zanzalakht was more superior for growth of these fungi, followed by, extracts from wood of Casuarina, Sunt, Kafur, Sarw, Abal and Tut. The resultant of linear growth on these wood extracts "in mm" were 73.3, 61.4, 53.0, 52.2, 46.2, 42.5 and 35.4 mm, respectively. Regarding with fungi, tiie highest linear growth on different wood extracts were produced by *Trichoderma album* (isolate No. 4) followed by *Aspergillus glaucus* isolate No. 3, *Botryodiplodia*

theobromae, *Trichoderma glacum*, *Aspergillus glaucus* isolate No. 1 and *Aspergillus flavus* isolate No. 1.

The same data prove also that the inhibiting effects of the tested wood extracts were differed according to the investigated fungal isolate and kind of wood from which extract was obtained. In this regard, extracts from Abal and Sarw woods on growth of *T. album*, extracts from Tut and Sunt woods on growth *T. koningi*, extracts from Tut wood on growth *T. album* and extracts from Kafur wood on growth *Penicillium chermesimum* exerted the most inhibitory effect. On the other hand, some wood extracts seemed to be had little or no inhibiting effects on growth of some investigated fungal isolates. For example, Kafur-wood extract on *B. theobromae*, Casuarina-wood extract on *A. flavus* isolate No. 2, Zanzalakht -extract on *A. glaucus* isolates No, 1 & 2, and Abal-extract on *T. album* isolate No. 1.

Table (12): Effect of different wood extract agar media on linear growth (in mm) of the different isolated fungi.

Fungal isolates	Wood extract of							Mean
	Kafur	Tut	Casuarina	Zanzalakht	Abal	Sunt	Sarw	
A. flavus (1)	49	36	65	80	61	36	53	54.3
A. flavus (2)	53	43	86	70	25	57	23	51.0
A. flavus (3)	29	26	30	28	24	52	25	30.6
A. glaucus (1)	56	26	57	88	27	78	55	55.3
A. glaucus (2)	46	37	65	89	40	39	47	51.9
A. glaucus (3)	76	51	78	84	38	83	59	67.0
B. theobromoe	90	52	24	89	47	54	56	58.9
P. chermesinum	14	27	32	56	63	52	64	44.0
T. album (1)	24	14	74	68	87	32	62	51.6
T. album (2)	69	25	53	76	30	66	39	51.1
T. album (3)	61	27	81	63	6	76	17	47.3
T. album (4)	56	63	77	76	59	77	78	69.4
T. glacum	75	64	74	69	58	33	26	57.0
T. koningi	33	4	63	90	30	7	43	38.6
Means	52.2	35.4	61.4	73.3	42.5	53.0	46.2	56.0
L.S.D. at 5%	21.8	5.5	12.4	13.1	10.1	10.2	8.9	

2- Effect of different media on the linear growth:

In this study, different nutritive solid media were used to determine their effect on linear growths of the tested fungi. Data in **Table (13)** and **Fig. (5 A, B, D & T)** declare that PDA medium was the best one for growing all tested fungi, followed in order by Czapek's, Richard's, Peptone dextrose,

Dubos, Nutrient and Abram's agar media. The linear growths of *B. theobromae* on Czapek's and Nutrient agar media, *A. glaucus* on Peptone dextrose agar medium, *T. album* on Dubos and Richard's agar media were significantly higher when compared with growth of the other three tested fungi on the same medium (or media). It could be notice also that the lowest linear growths of *T. koningi*, *T. album* and *A. glaucus* was produced on Nutrient agar medium, meanwhile linear growth of *B. theobromae*, was greatly supressed on both Abram's and Dubos agar media.

Table (13): Effect of different agar media on linear growth of the tested fungi.

Agar Medium	Tested fungus				Mean
	B.theobromae	*T. koningi*	*A. glaucus*	*T. album*	
PDA	90	90	90	90	90.0
Czapek's	85	75	67	79	76.5
Pepton dextrose	43	39	56	49	46.8
Dubos	29	49	46	53	44.3
Nutrient	62	33	30	32	39.3
Martin's	69	59	58	61	61.8
Richard's	46	56	54	67	55.8
Abram's	24	45	49	33	37.8
Mean	56.0	55.8	56.3	58.0	

L.S.D. at 5% for: Fungi (F) 1.07 Medium (M) 1.51 F x M 3.02

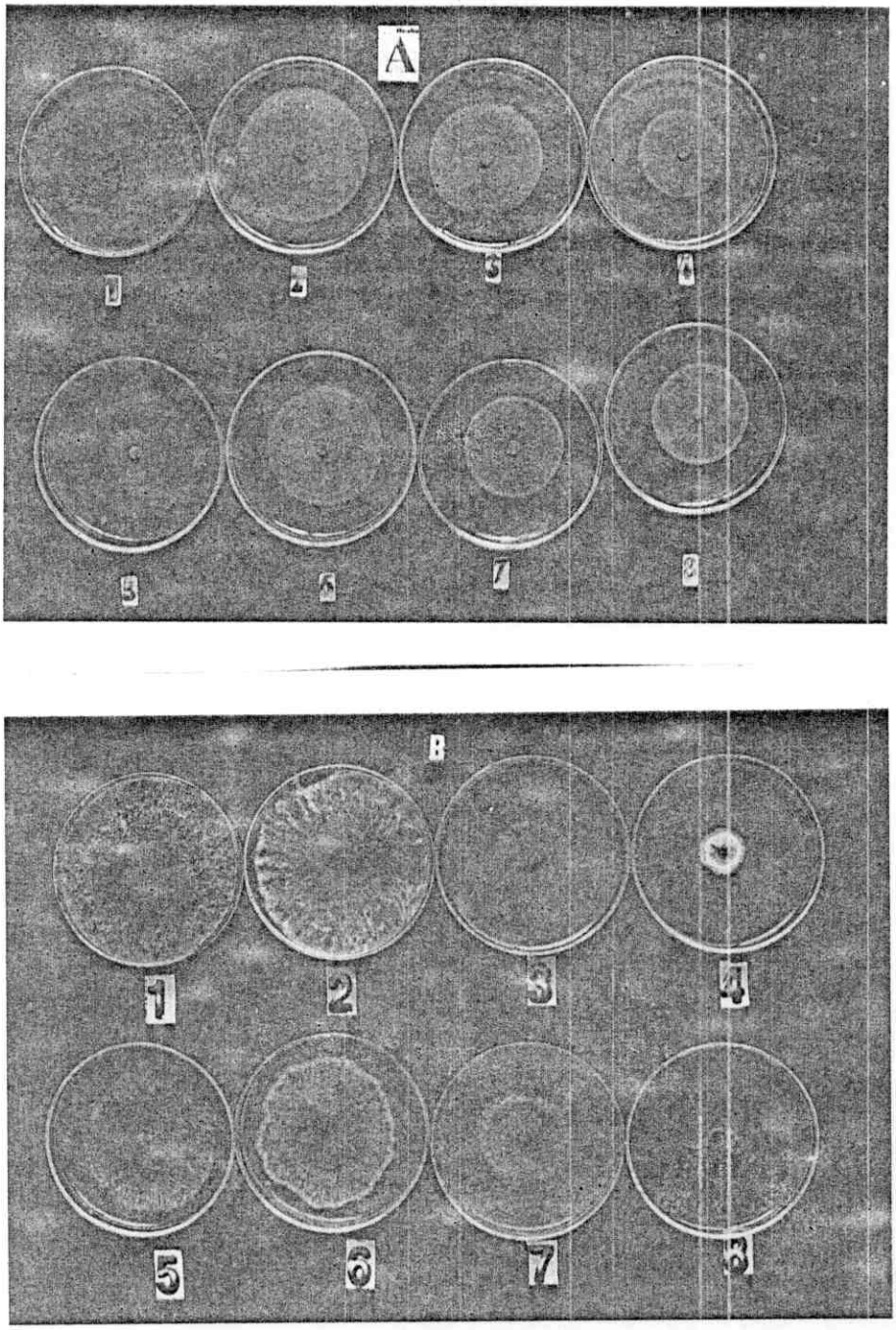


Fig. (5): Effect of PDA (1); Czapek's (2); Peptone dextrose (3); Dubos (4); Nutrient (5); Martin's (6); Richard's (7); and Abram's (8) agar media on linear growth of *A. glaucus* (A) and *B. theobromae* (B).

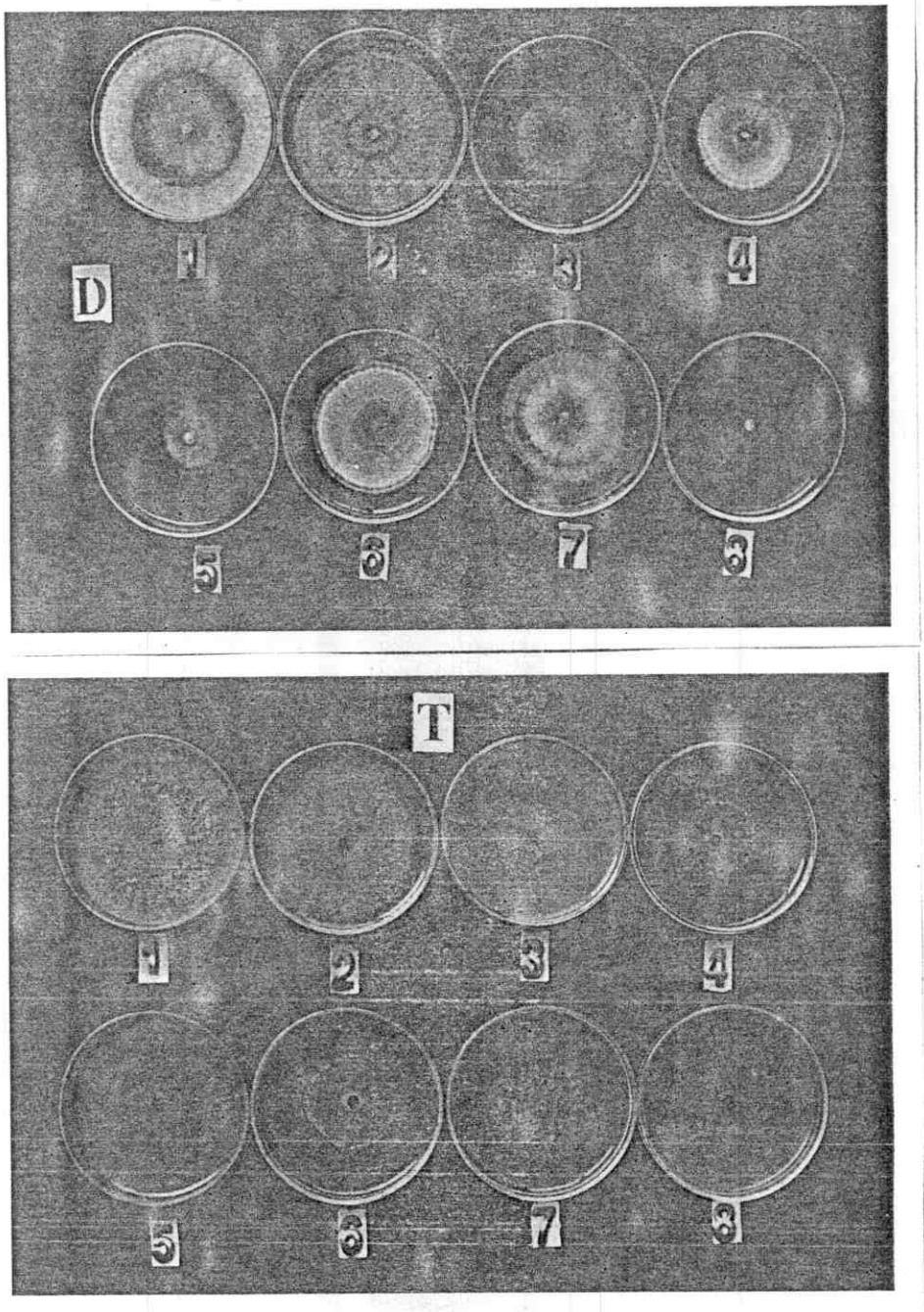


Fig. (5 **continue):** Effect of PDA (1); Czapek's (2); Peptone dextrose (3); Dubos (4); Nutrient (5); Martin's (6); Richard's (7); and Abram's (8) agar media on linear growth of *T. album* (**D**) and *T. koningi* (**T**).

3- Effect of pH values on the linear growth:

The obtained results (**Table 14**) and **Fig. (6 A, B, D & T)** illustrate that non of the tested wood deteriorating fungi could grow at 4.0 pH. The linear growth of all fungi was more slower at 4.6 pH but it was conspicuously increased by raising pH values up to 6 pH for *A. glaucus* and 6.6 pH for *B. theobromae*; *T. koningi*; and *T. album*. Elevating pH values above these limits resulted in lowering linear growth of the respective fungus. The linear growths of both *T. koningi* and *T. album* were relatively higher than those of *B. theobromae* and *A. glaucus* at 7.6, 8.0 and 8.6 pH.

Table (14): Effect of different pH values on linear growth (in mm) of the tested wood deteriorating fungi.

pH	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
4.0	0	0	0	0	0
4.6	13	17	21	11	15.5
5.0	40	33	59	33	41.3
5.6	72	75	79	67	73.3
6.0	86	82	90	83	85.3
6.6	90	90	79	90	87.3
7.0	79	79	67	79	76.0
7.6	64	70	55	69	64.5
8.0	55	64	48	57	56.0
8.6	39	41	31	39	37.5
Mean	53.8	55.1	52.9	52.8	

L.S.D. at 5% for:	Fungi (F)	pH (P)	F x P
	0.64	0.44	1.38

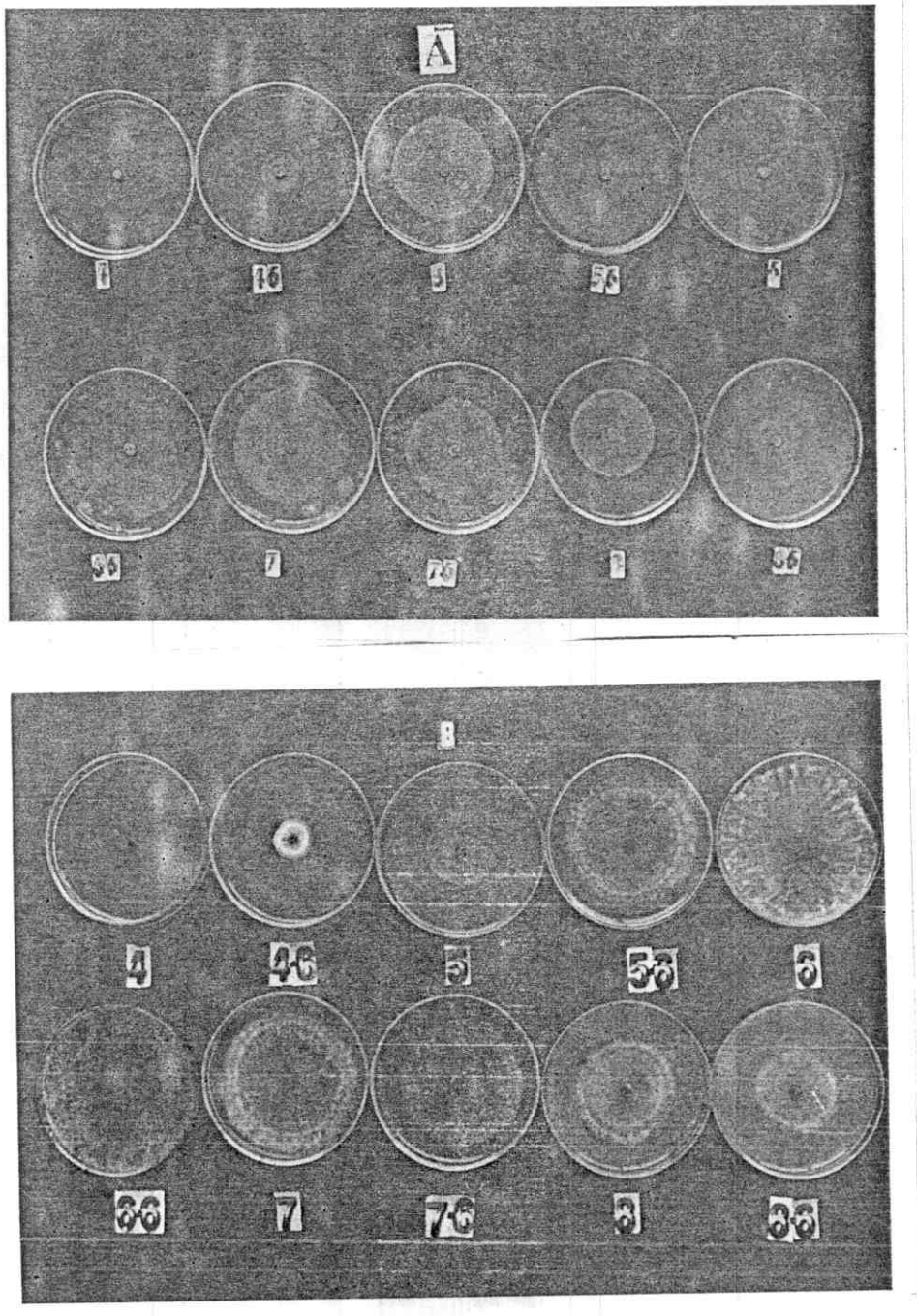


Fig. (6): Effect of different pH values on linear growth of *B. theobromae* (B) and *A glaucus* (A).

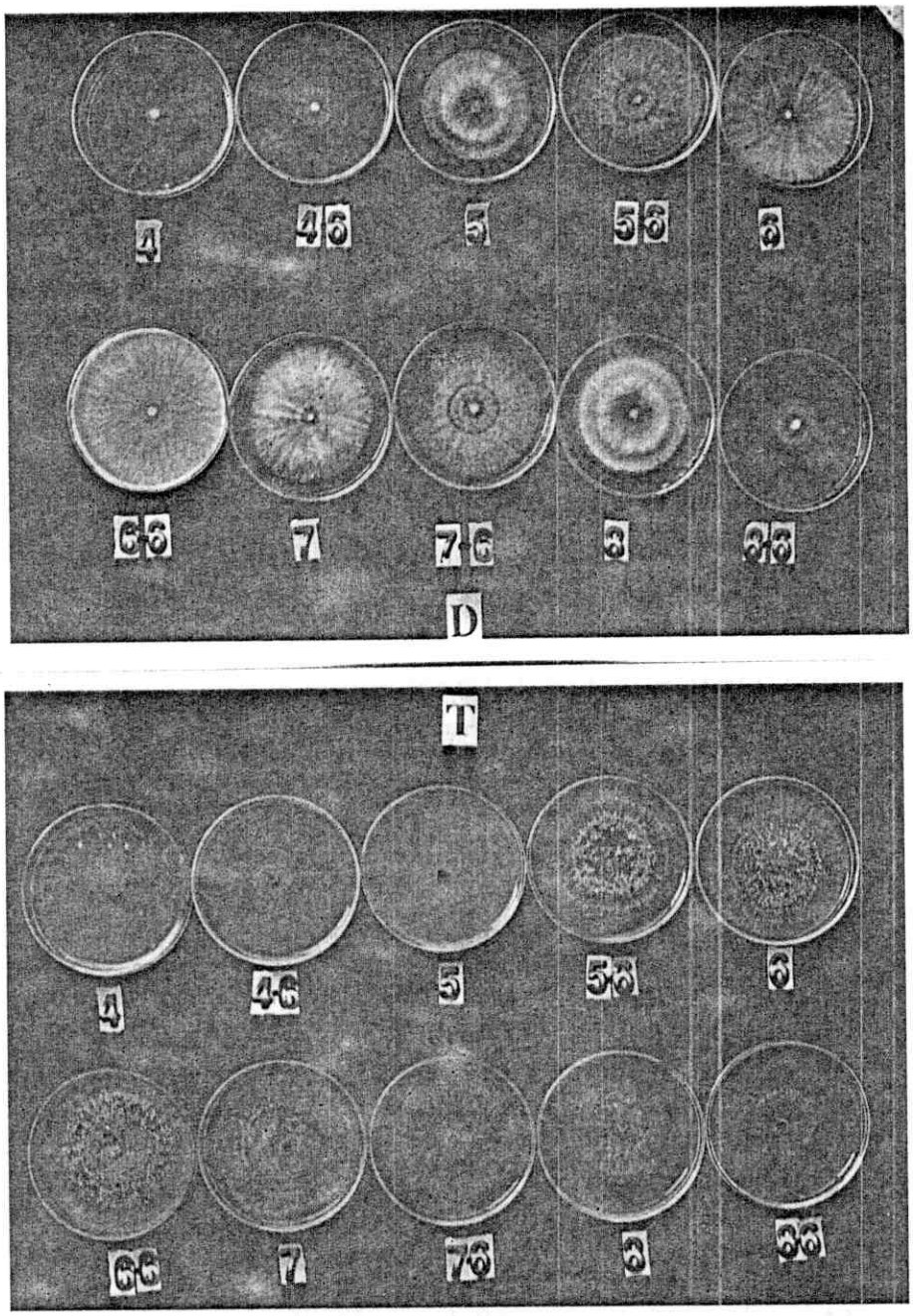


Fig. (6 continued): Effect of different pH values on linear growth of *T. album* (D) and *T. koningi* (T).

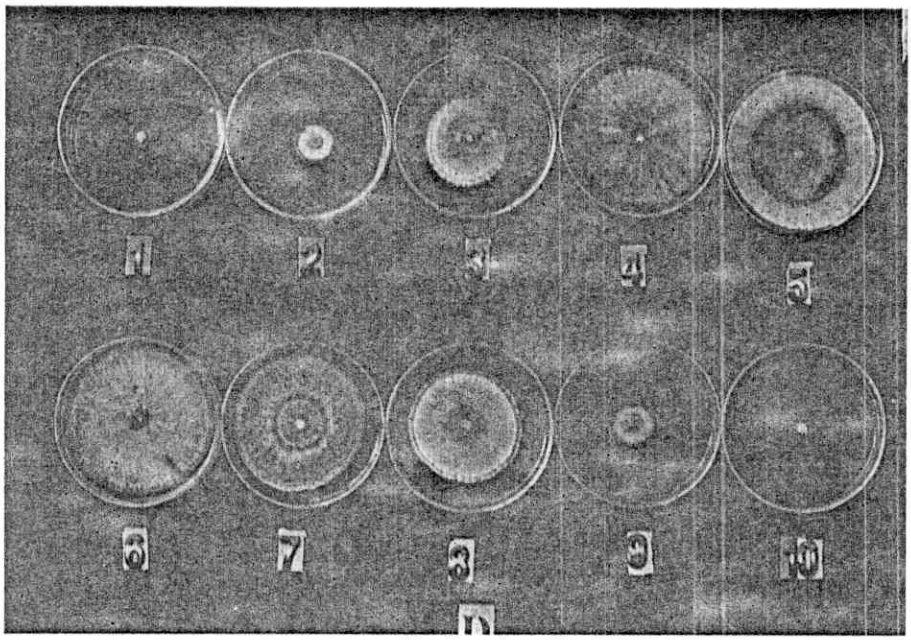
4- Effect of temperature on the linear growth:

Data tabulated in **Table (15)** and **Fig. (7 A, B, D & T)** indicate that all tested fungi could not grow at the minimum 5°C and maximum 50°C. The highest linear growths of *T. koningi; A. glaucus;* and *T. album* were produced at 25°C, however, *B. theobromae* produced its best linear growth at 30°C. All fungi could grow at 40°C than at 15°C, but their linear growth at 45°C was relatively comparable with those produced at 10°C. Under the different tested temperatures, the average of linear growth of *T. koningi* was relatively the highest followed by *T. album*, *B. theobromae* and *A. glaucus*.

Table (15): Effect of different temperature on linear growth in mm of the tested wood deteriorating fungi.

°C	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
5	0	0	0	0	0
10	12	19	14	20	16.3
15	31	51	50	51	45.8
20	64	81	78	81	58.5
25	82	90	90	90	88.0
30	90	86	79	83	84.5
35	79	80	61	79	74.8
40	55	65	51	63	58.5
45	11	22	15	20	17.0
50	0	0	0	0	0.0
Mean	42.4	49.4	36.78	48.7	--

L.S.D. at 5% for:	Fungi (F)	Temp. (T)	F x T
	0.32	0.50	1.01



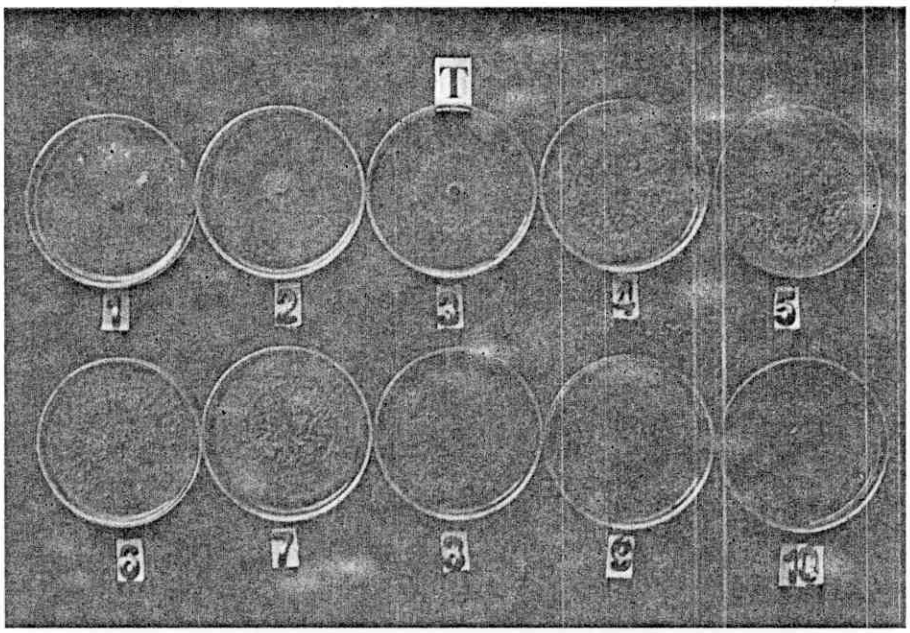


Fig. (7): Effect of temperature degrees on linear growth of *T. album* (D) and *T. koningi* (T). 1= 5°C; 2= 10°C; 3= 15°C; 4= 20°C; 5= 25°C; 6= 30°C; 7= 35°C: 8= 40°C; 9= 45°C and 10= 50°C.

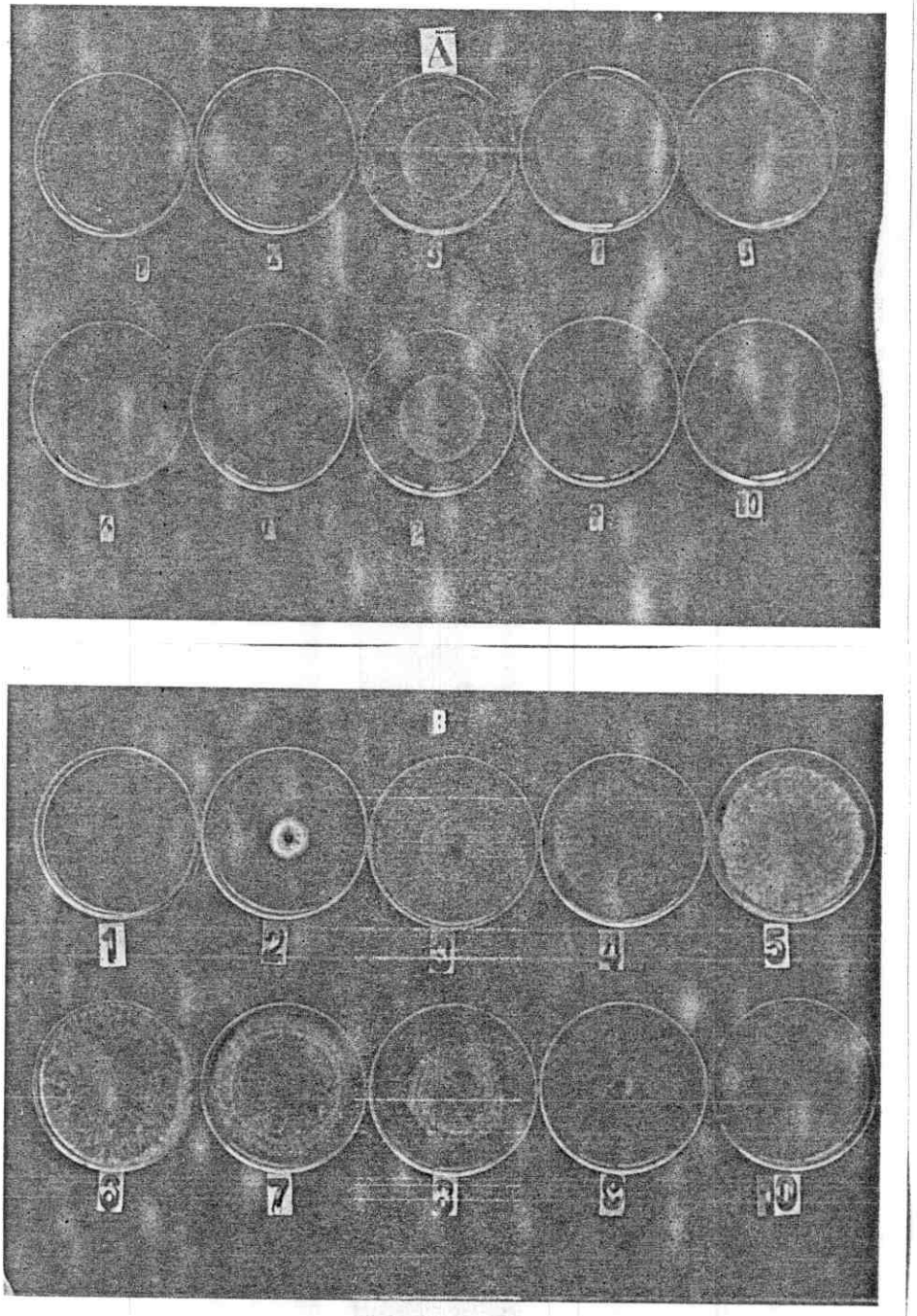


Fig. (7 continued): Effect of temperature degrees on linear growth of *B. theobromae* (B) and *A. glaucus* (A). 1= 5°C; 2= 10°C; 3= 15°C; 4= 20°C; 5= 25°C; 6= 30°C; 7= 35°C; 8= 40°C; 9= 45°C and 10= 50°C.

5- Effect of different carbon sources on the linear growth:

Different carbon sources i.e. glucose, starch, fructose, maltose, lactose, carboxy methyl cellulose and cellulose were tested for their effect on the linear growth of the tested fungal isolates (*B. theobromae, T. koningi, T. album.* and *A. glaucus*). Data in the **Table (16)** and **Fig. (8 A, B, D & T)** state that all tested wood deteriorating fungi could grow with different extents on media containing different carbon sources. The fungi *B. theobromae*, *T. koningi*, and *T. album* could utilized starch better than *A. glaucus*, however *A. glaucus* and *B. theobromae* utilized carboxy methyl cellulose (CMC) better than both *T. koningi*, and *T. album*. In general, the linear growth was faster on media containing glucose followed by those containing sucrose, fructose, maltose, lactose, starch and CMC. However the lowest linear growth was produced on media with powdered cellulose.

Table (16): Effect of different carbon sources on linear growth (in cm) of the tested wood deteriorating fungi.

C - source	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
Sucrose	89	90	85	90	88.5
Starch	42	31	20	32	31.3
Glucose	90	90	90	90	90.0
Fractose	87	89	78	89	85.8
Lactose	67	58	62	62	62.3
CMC	34	20	37	20	27.8
Maltose	76	78	81	80	78.8
Cellulose	16	10	11	10	11.8
Mean	62.6	58.3	58.0	59.1	--

L.S.D. at 5% for:	Fungi (F)	C-source (C)	F x C
	0.62	0.44	1.25

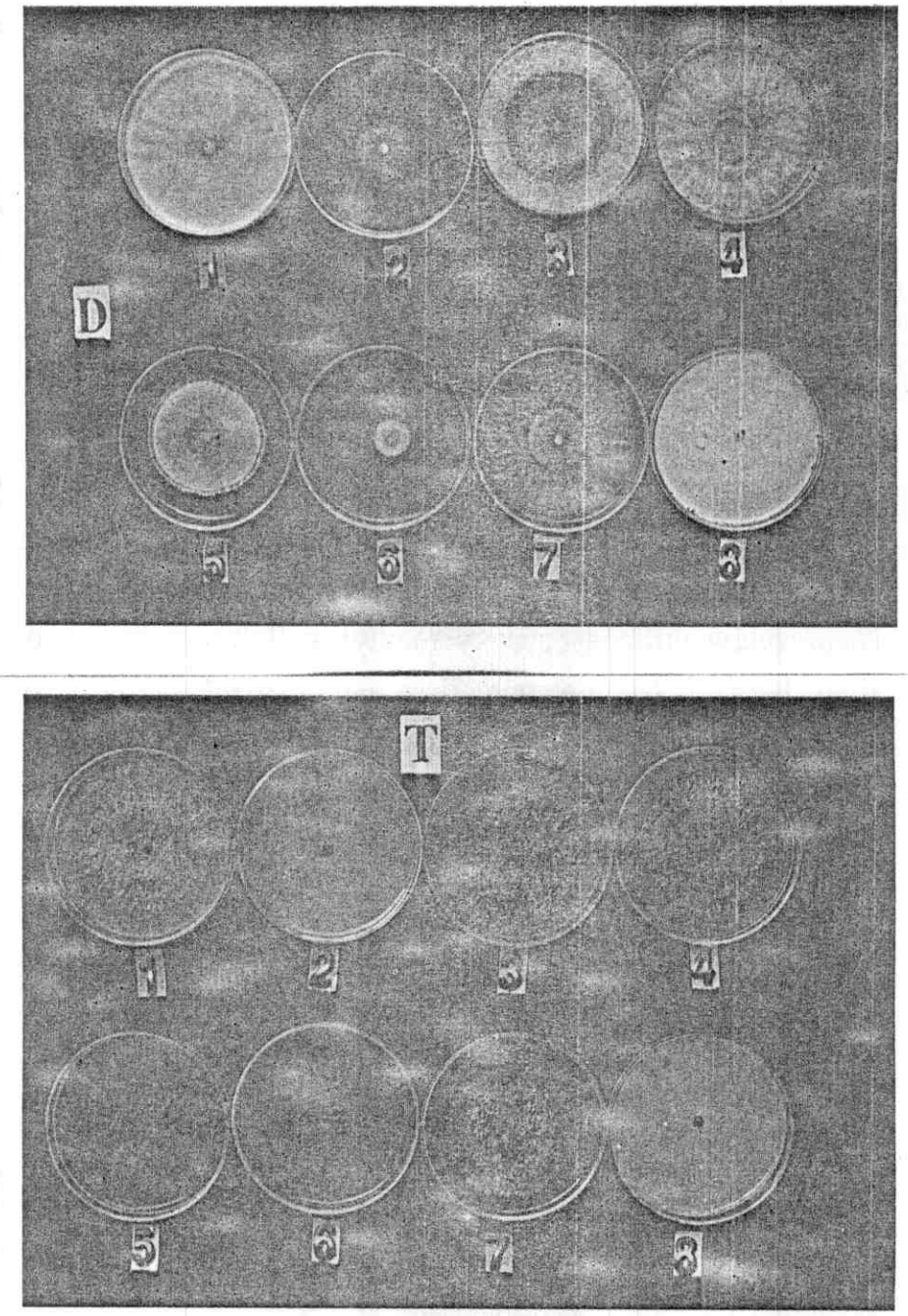


Fig. (8): Effect of Sucrose (1); Starch (2); Glucose (3); Fructose (4); Lactose (5); CMC (6), Maltose (7) and Cellulose (8) as sole sources of carbon on linear growth of *T. album* (D) and *T. koningi* (T).

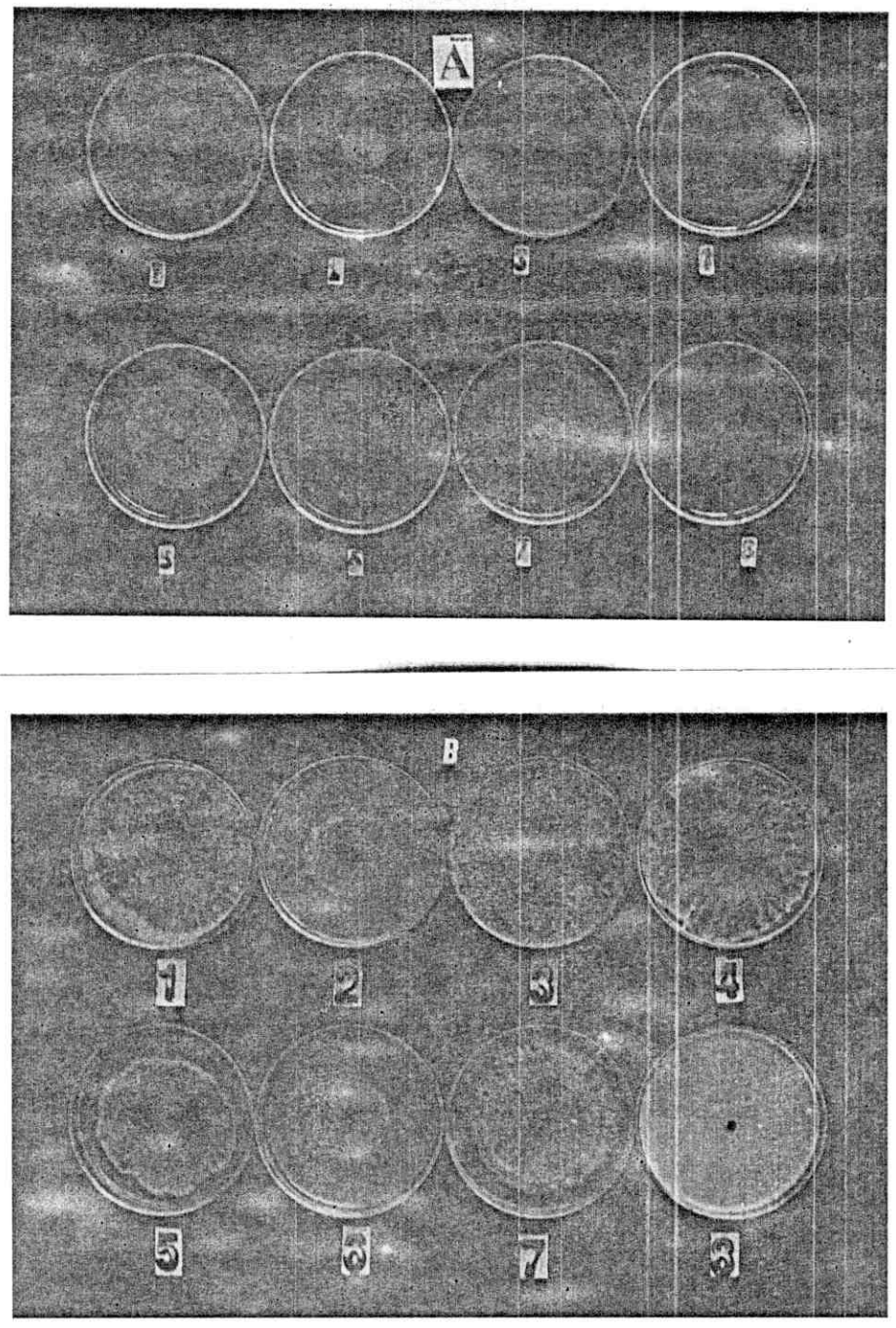


Fig. (8 continued): Effect of Sucrose (1); Starch (2); Glucose (3); Fructose (4); Lactose (5); CMC (6), Maltose (7) and Cellulose (8) as sole sources of carbon on linear growth of *B. theobromae* (B) and *A. glaucus* (A).

6- Effect of different nitrogen sources on the linear growth:

Different N-sources, *i.e.* sodium nitrate, potassium nitrate, ammonium nitrate, ammonium sulfate, sodium nitrite, urea, gelatin, beef extract, peptone, and casein were tested for their effect on the linear growth of the tested fungal isolates (*B. theobromae, T. koningi, T. album*, and *A. glaucus*).

Data in **Table (17)** and **Fig. (9 a, b, c & d)** indicate that ammonium nitrate followed by potassium nitrate. Beef extract, ammonium sulfate were the best tested N sources for growth of the investigated wood deteriorating fungi. The lowest average linear growth was obtained on media containing urea as N-source. Regarding fungi, Beef extract and ammonium nitrate were the best N-sources for growth of *A. glaucus* and *B. theobromae*, respectively. However, ammonium sulfate was the best one for growth of both *T. koningi* and *T. album*. Among the tested inorganic nitrogen sources, sodium nitite was the least favorable for growth of the tested fungi. Good linear growth of these fungi were obtained also on the organic nitrogen sources, Gelatin and Casein.

Table (17): Effect of different nitrogen sources on linear growth "in mm" of the tested wood deteriorating fungi.

N-Source	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
$(NH_4)_2SO_4$	82	90	45	90	76.8
NH_4NO_3	90	86	64	79	79.8
KNO_3	79	86	72	80	79.3
Na NO_3	69	75	74	64	70.5
$NaNO_2$	67	69	66	63	66.3
Urea	24	26	27	25	25.5
Peptone	74	77	70	66	71.8
Beef extract	71	80	90	72	78.3
Gelatin	80	72	52	68	68.0
Casein	75	83	67	70	73.8
Mean	71.1	74.4	62.7	67.7	

L.S.D. at 5% for:	Fungi (F)	N-source (N)	F x N
	0.50	0.32	1.02

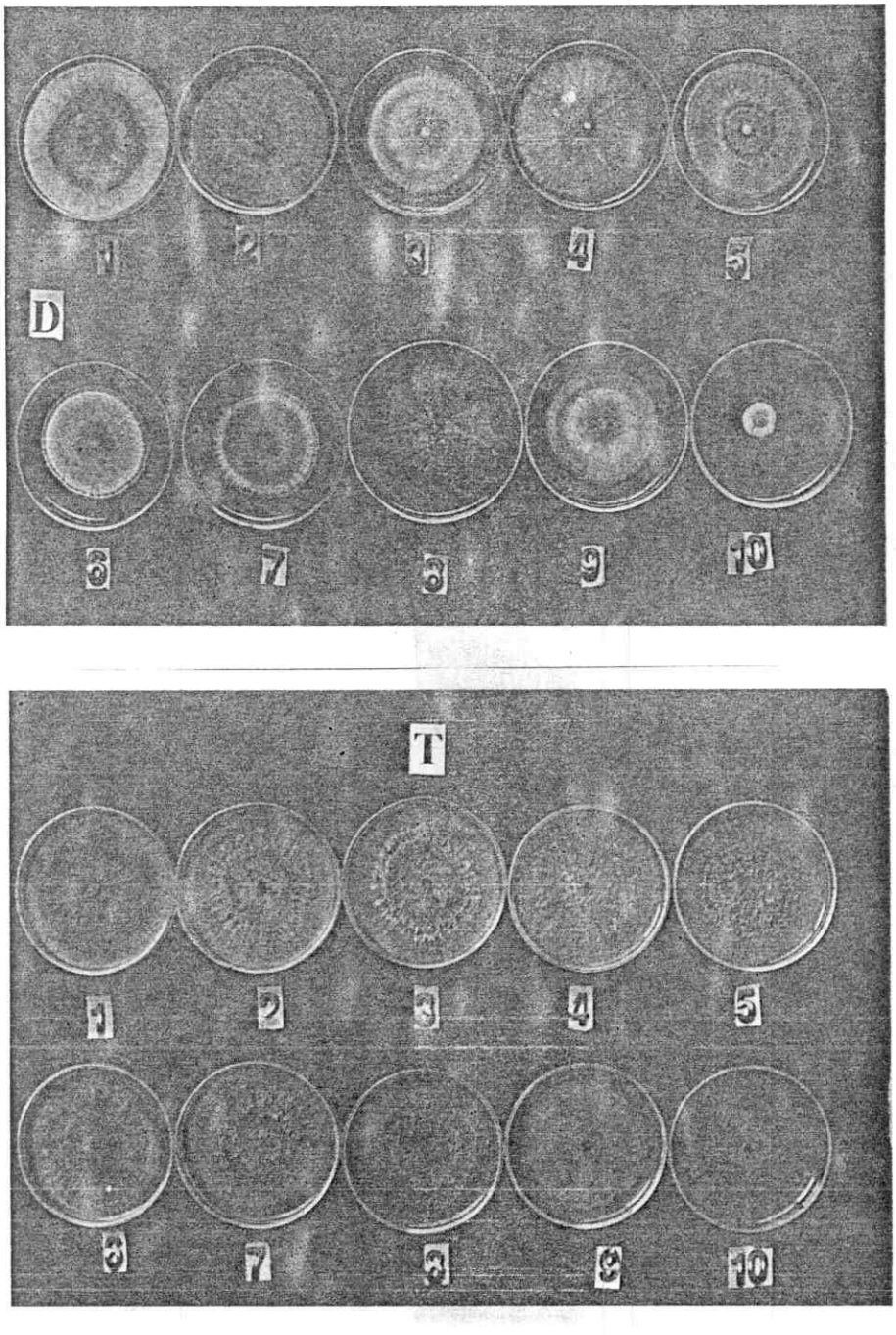


Fig. (9): Effect of $(NH_4)_2SO_4$ (1); NH_4NO_3 (2); Casein (3); KNO_3 (4); Beef extract (5); Na NO_3 (6); Peptone (7); Gelatin (8); $NaNO_2$ (9); and $Ca(NH_2)_2$ (10)as N-sources on linear growth of *T. album* (D) and *T. koningi* (T).

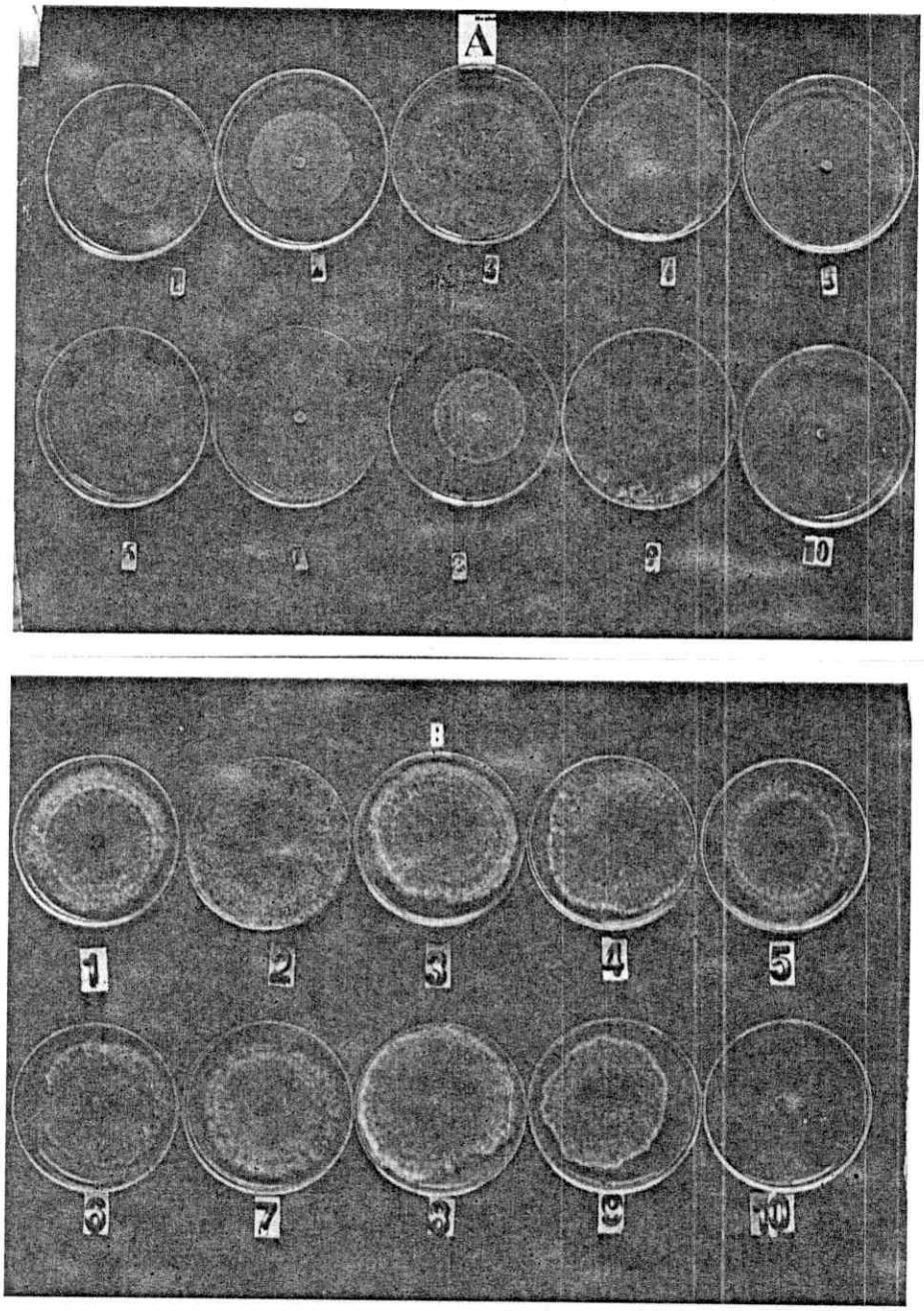


Fig. (9 continued): Effect of $(NH_4)_2SO_4$ (1); NH_4NO_3 (2); Casein (3); KNO_3 (4); Beef extract (5); Na NO_3 (6); Peptone (7); Gelatin (8); $NaNO_2$ (9); and $Ca(NH_2)_2$ (10)as N-sources on linear growth of *B. theobromae* (B) and *A. glaucus* (A)

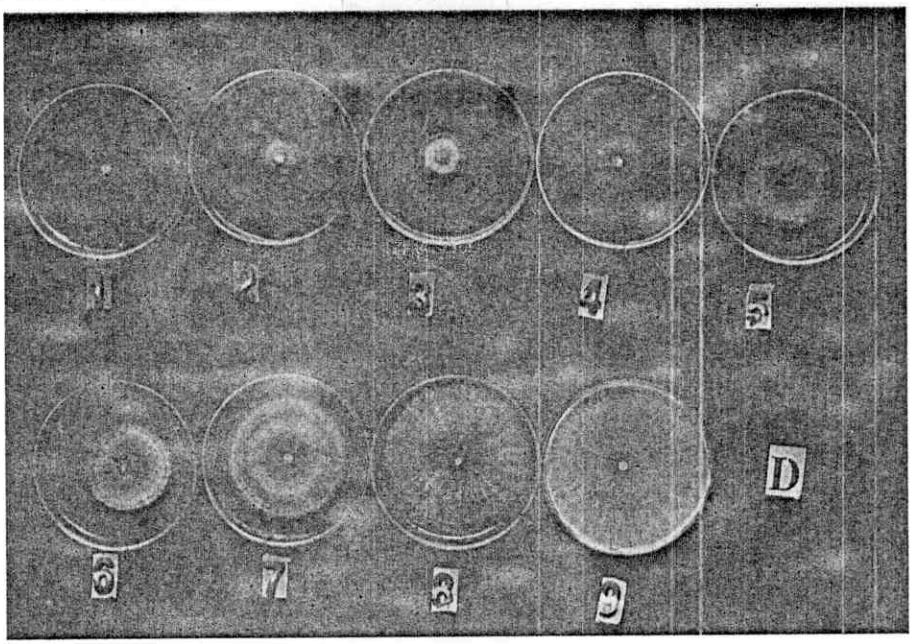
7- Effect of relative humidity on the linear growth:

Data in **Table (18)** and **Fig. (10 A, B, D & T)** indicate clearly that the linear growth of all tested fungi was significantly affected by fluctuation in relative humidity. The linear growth of the tested fungi was significantly increased by increasing R.H. from 14.5 to 100%. However *A. glaucus*-linear growth reached its maximum at 80% R.H. then decreased significantly again. In general, the tested fungi could be arranged in descending order according to its sensitivity to variation in R.H. as following: *B. theobromae* (64.4 mm), *A. glaucus* (57.6 mm), *T. album* (44.1 mm), and *T. koningi* (42.4 mm). The linear growth of *A. glaucus* was sharply decreased at 100% R.H. (30.0 mm) compared with 80% R.H. (90.0 mm). At the minimum (14.5%) R.H., *B. theobromae* produced satisfactory linear growth (32.0 mm) while growth of *T. album* was greatly suppressed (9.0 mm).

Table (18): Effect of relative humidity (RH) on linear growth (in mm) of the 4 tested wood deteriorating fungi.

R.H. (%)	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
14.5	32	14	19	9	18.5
50	57	19	25	21	30.5
65	60	24	41	26	37.8
70	68	31	74	34	51.8
75	68	45	83	51	61.8
80	72	56	90	58	69.0
85	77	70	74	72	73.3
95	81	80	55	82	74.5
100	90	90	30	90	75.0
Mean	64.4	42.4	57.6	44.1	

L.S.D. at 5% for:	Fungi (F)	PH (P)	F x P
	4.90	0.95	0.99



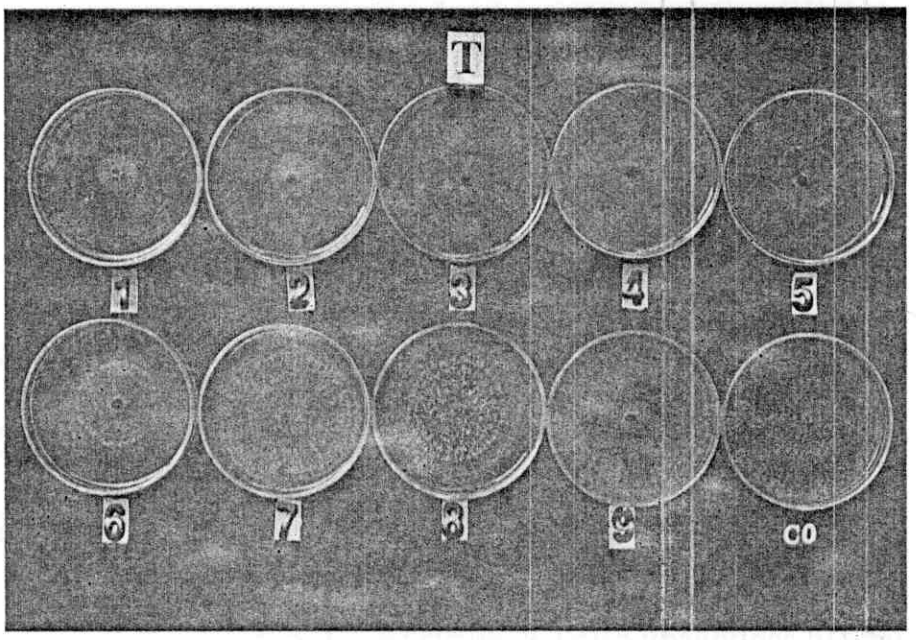


Fig. (10): Effect of different RH (1=14.5%; 2 = 50%; 3=65%; 4= 70%; 5=75%; 6 = 80%; 7 = 85%; 8 = 95%: and 9 = 100%) on linear growth of *T. album* (D) and *T. koningi* (T).

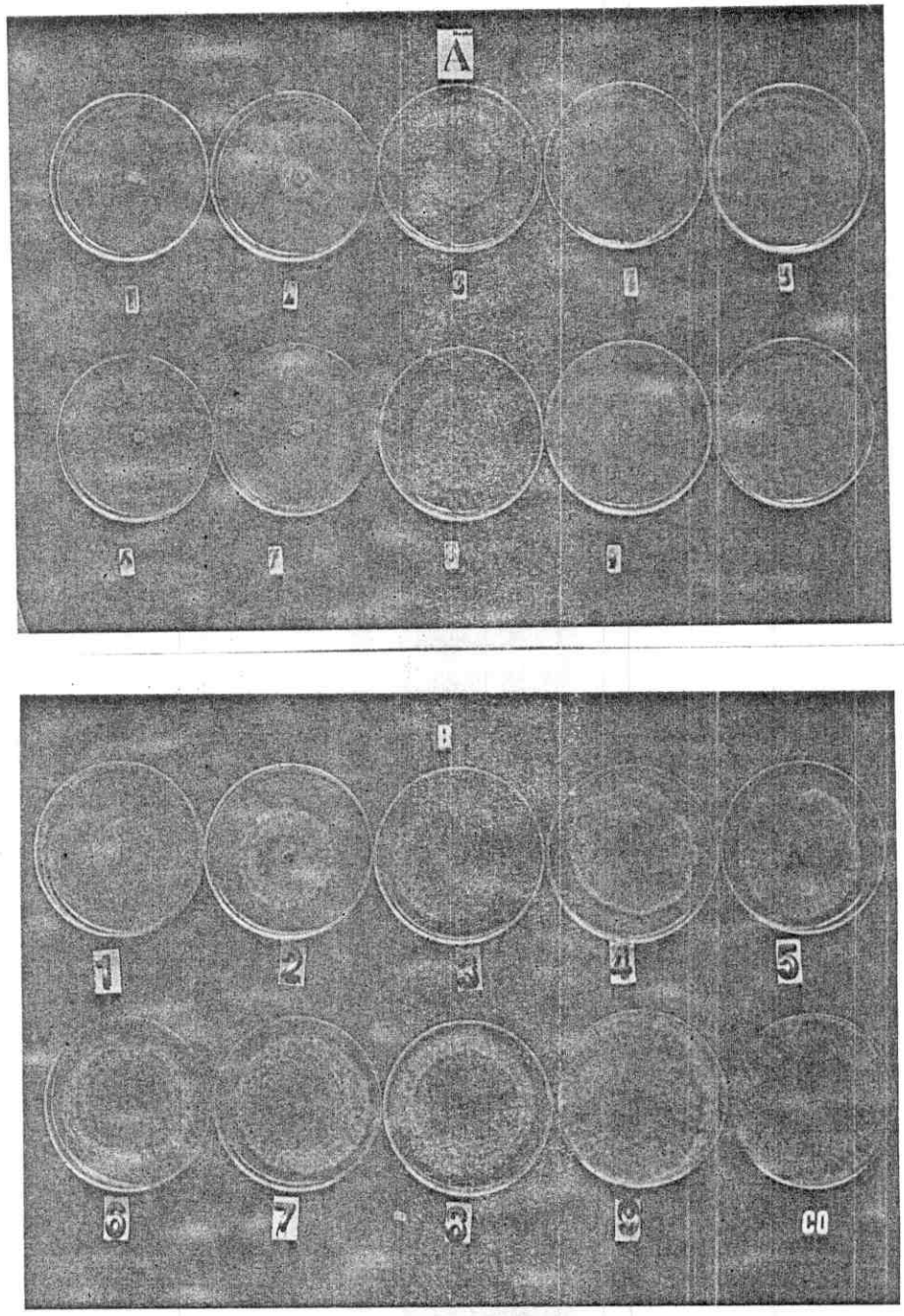


Fig. (10 continued): Effect of different R.H (1= 14.5%; 2 = 50%; 3 = 65%; 4 = 70%; 5 = 75%; 6 = 80%; 7 = 85%; 8 = 95%; and 9 = 100%) on linear growth of *B. theobromae* (B) and *A. glaucus* (A).

8- Effect of light wavelength on the linear growth:

Data in **Table (19)** and **Fig. (11 A, B, D & T)** declare that the highest linear growth averages of all tested wood deteriorating fungi were obtained under green light conditions (90 mm) followed by white light (88.5 mm) and the complete darkness "black" (86.0 mm). The lowest averages of linear growth were associated with both red light (31.4 mm) and blue light (28.0 mm). The greater suppressing effect of red light was on growth of *A. glaucus* (20 mm), meanwhile linear growth of *B. theobromae* (47 mm) was the less affected. On the other hand, the blue light conditions suppressed linear growth of both *T. koningi* and *T. album* more than linear growths of *A. glaucus* and *B. theobromae*. The linear growth of latter fungus seems to be less affected by variation in light conditions (68.1 mm) when compared with *Trichoderma koningi* (63.2 mm), *T. album* (63.8 mm) and *A. glaucus* (62.0 mm).

Table (19): Effect of different light wavelengths on linear growth (in mm) of the 4 tested wood deteriorating fungi.

Light	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
white	89	90	85	90	88.5
Red	47	31	20	32	31.4
Green	90	90	90	90	90.0
Black	87	89	78	89	86.0
Yellow	67	69	62	62	62.0
Blue	34	20	37	20	28.0
Mean	68.1	63.2	62.0	63.8	6.43

L.S.D. at 5% for:	Fungi (F)	Lightwave (L)	F x L
	0.52	0.43	1.05

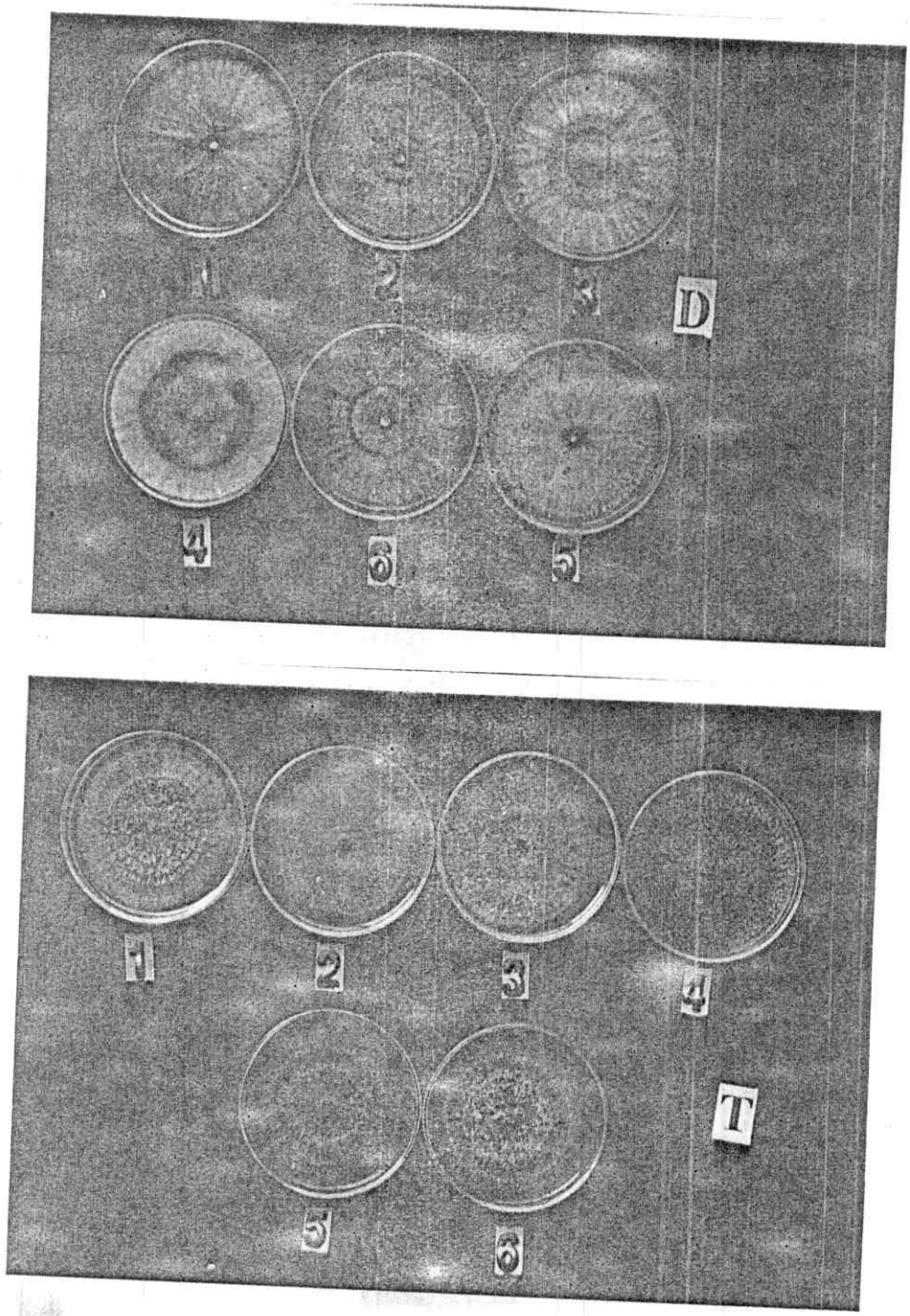
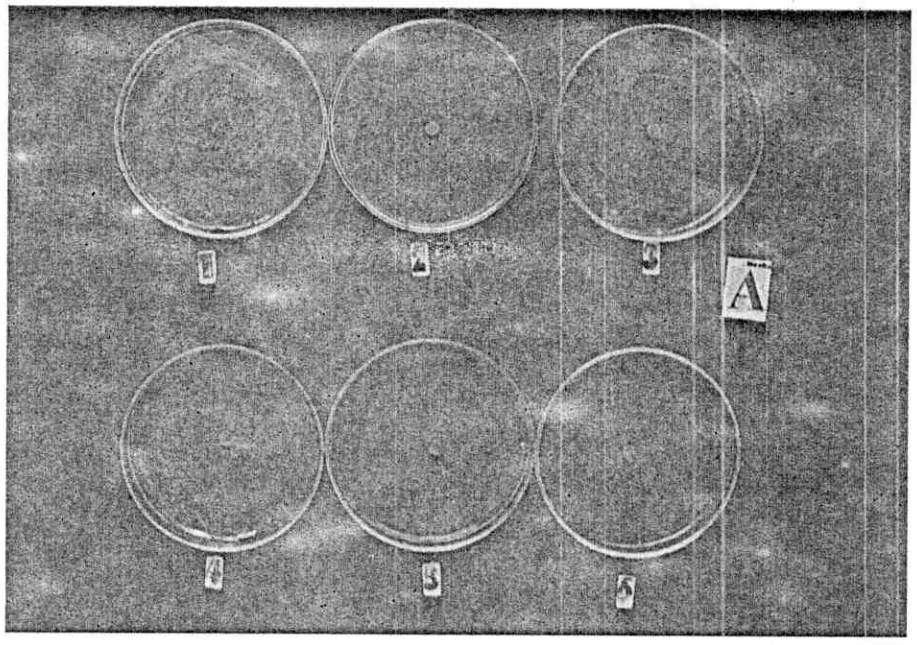


Fig. (11): Effect of different light wavelengths i.e. White (1); Red (2); Green (3); Black (4): Yellow (5) and Blue (6) on linear growth of *T. album* (D) and *T. koningi* (T).



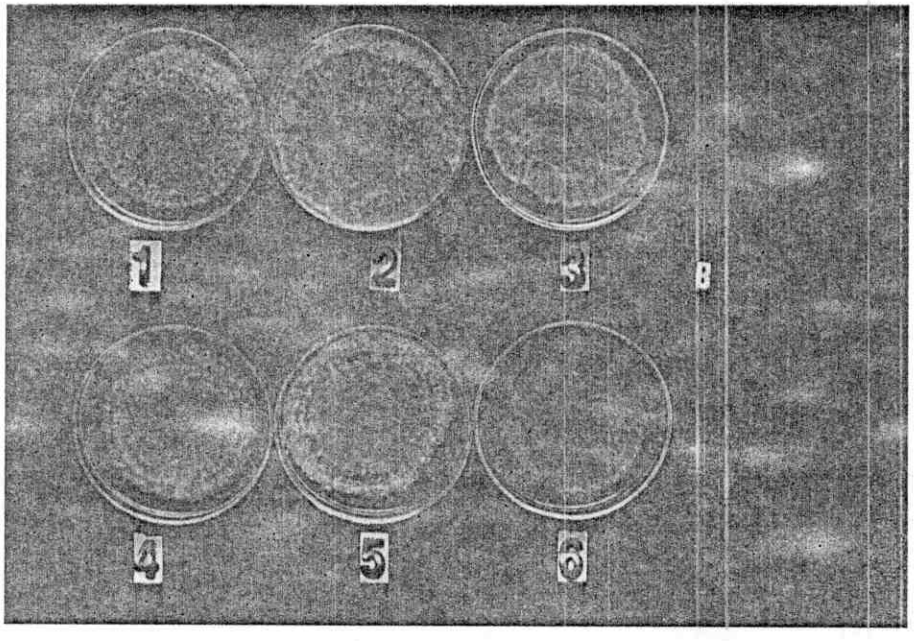


Fig. (11 continued): Effect of different light wavelengths i.e. White (1); Red (2); Green (3); Black (4); Yellow (5) and Blue (6) on linear growth of *B. theobromae* (B) and *A. glaucus* (A).

9- Effect of C/N ratio on the linear growth:

In this study, linear growth of the tested wood deteriorating fungi were investigated as affected by different C/N ratios. Data in **Table (20)** and **Fig. (12 a, b, c & d)** prove that all tested wood deteriorating fungi could grew on a wide C/N ratios. The highest linear growth of *B. theobromae, T. koningi* and *T. album* were produced on medium having C:N ratio of 18:1, however medium with C:N ratio of 72:1 was the best for linear growth of *A. glaucus*.

The linear growth of the first three fungi was decreased by raising C:N ratio in growth medium above 18:1, meanwhile growth of the latter one *i.e. A. glaucus* was negatively affected by the narrower than the wider C:N ratios. The opposite trends were noticed with the three formers.

Table (20): Effect of C/N ratio on linear growth (in mm) of the 4 tested wood deteriorating fungi.

C:N	*B. theobromae*	*T. koningi*	*A. glaucus*	*T. album*	Mean
5:1	73	78	54	79	71.0
9:1	83	82	58	80	75.8
18:1	90	90	68	90	84.5
36:1	84	82	70	82	79.5
54:1	69	78	79	76	75.5
72:1	64	70	90	70	73.5
182:1	56	64	87	63	67.5
Mean	74.0	77.7	71.9	77.1	--

L.S.D. at 5% for:	Fungi (F)	C/N	F x C/N
	0.37	0.49	0.89

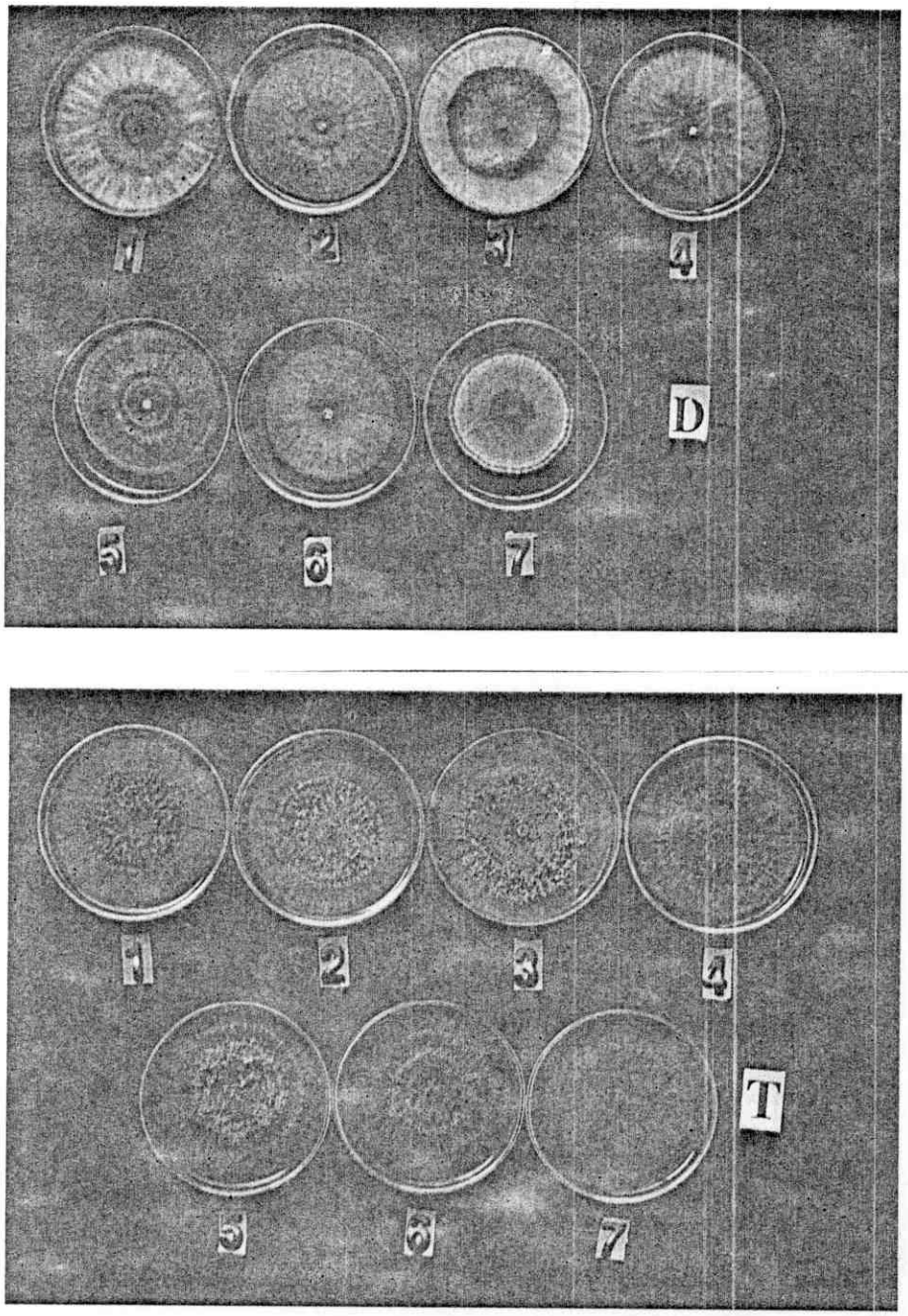


Fig. (12): Effect of different C/N ratio (1= 5:1; 2 = 9:1; 3 = 18:1; 4 = 36:1; 5 = 54:1; 6 = 72:1 and 7 = 182:1) on linear growth of *T. album* (D) and *T. koningi* (T).

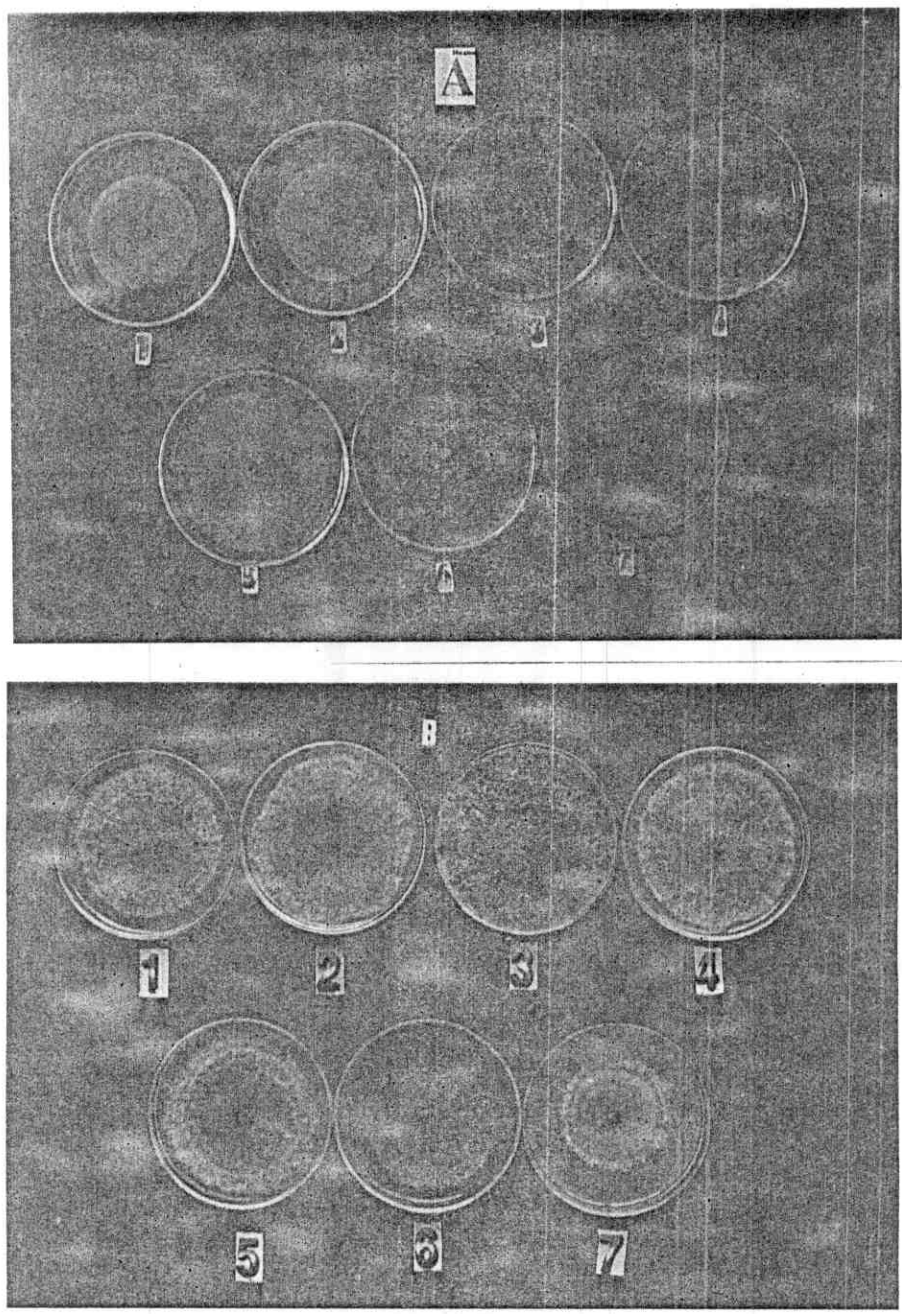


Fig. (12 continued): Effect of different C/N ratio (1= 5:1; 2 = 9:1; 3 = 18:1; 4 = 36:1; 5 = 54:1; 6 = 72:1 and 7 = 182:1) on linear growth of *B. theobromae* (B) and *A. glaucus* (A).

10- Effect of pH value on cellulolytic enzyme activities:

In this study, effect of different pH values on cellulolytic enzymes activities in cultural filtrates "14 days-old" of the tested fungi (expressed as in viscosity loss% of substrate reaction, *i.e.* 1.2% carboxy methyl cellulose "CMC") along 5-180 minutes were investigated.

Data in **Tables (21, 22, 23, 24 & 25)** indicate that the activity of cellulolytic enzymes expressed as loss% in viscosity of substrate reaction was more pronounced in cultural filtrates of *B. theobromae* (81.85%), followed by *A. glaucus* (73.72%), *T. koningi* (72.03%), and *T. album* (62.31%). The same data prove that cellulolytic enzymes activities were greatly affected by pH value in substrate mixture. The highest activities, however, were at pH 6.6 for *B. theobromae*, *T. album*, and *T. koningi* and at pH 6.0 for *A. glaucus*. Changing in these pH values by increase or decrease resulted in decreasing cellulolytic enzymes activities for these fungi. Reduction in cellulolytic enzymes activity by increasing or decreasing pH value than the optimum level (pH 6.0) was more pronounced in case of *A. glaucus* than the other tested fungi.

The same data show also that the activity of cellulolytic enzymes seems to be affected by time reaction. The cellulolytic enzymes activities after 5 minutes were conspicuously higher in case of of *B. theobromae* (48.96% loss in viscosity) than the other three tested fungi i.e. *A.*

glaucus (40.97%), *T. album* (37.35%), and *T. koningi* (30.43%). The cellulolytic enzymes activities expressed as % loss in viscosity were steadily increased by time and reached its maximum after 180 and 80 minutes in case of the three latter fungi and *B. theobromae*, respectively. In this respect, clear variations were noticed also between fungi at each given pH value and time of reaction.

Table (21): Cellulolytic enzymes activities in cultural filtrates of *B. theobromae* as affected by both pH values and time of reaction.

	Time of Reaction (min.)							
pH	5	10	30	50	80	120	180	Mean
4.0	39.1	53.9	77.7	84.5	85.9	85.9	85.9	73.27
4.6	46.5	72.2	80.0	89.0	91.0	91.0	91.0	80.10
5.0	51.7	75.0	85.3	91.3	92.5	92.6	92.6	83.00
5.6	53.0	79.5	88.7	92.9	93.2	93.2	93.2	84.81
6.0	65.2	86.4	91.3	93.4	94.5	94.5	94.5	88.54
6.6	78.3	90.7	93.8	94.8	95.9	95.9	95.9	92.19
7.0	61.2	88.6	90.4	91.2	93.0	93.0	93.0	87.2
7.6	49.1	84.1	88.1	91.0	92.5	92.5	92.5	84.26
8.0	31.4	71.4	77.5	87.7	89.7	89.7	89.7	76.73
8.6	14.1	65.4	70.7	81.0	82.6	82.6	82.6	68.43
Mean	48.96	76.72	84.35	89.68	91.08	91.09	91.09	81.85

L.S.D. at 5% for:	pH value (P)	Time (T)	P x T
	0.39	0.46	1.23

Table (22): Cellulolytic enzymes activities in cultural filtrates of *T. album* as affected by both pH values and time of reaction.

pH	Time of Reaction (min.)							Mean
	5	10	30	50	80	120	180	
4.0	30.6	36.3	39.5	43.4	55.6	68.8	73.2	49.63
4.6	34.0	39.0	44.0	49.3	58.3	71.5	81.3	53.91
5.0	36.3	43.1	48.1	53.6	64.5	78.1	87.2	58.70
5.6	40.0	50.1	52.4	62.5	69.5	80.6	90.6	63.67
6.0	47.1	53.2	58.5	68.9	76.2	84.3	91.2	68.49
6.6	50.7	62.5	63.0	71.1	81.4	87.7	94.5	72.99
7.0	43.2	61.5	62.2	70.7	81.1	85.5	87.5	70.24
7.6	33.5	56.4	60.3	67.2	76.6	82.6	84.6	65.89
8.0	31.3	52.6	55.3	63.2	73.3	78.0	78.0	61.67
8.6	26.8	43.5	52.9	60.6	71.2	73.8	76.2	57.86
Mean	37.35	49.82	53.62	61.05	70.77	79.09	84.43	62.30

L.S.D. at 5% for:	pH value (P)	Time (T)	P x T
	0.48	0.57	1.50

Table (23): Cellulolytic enzymes activities in cultural filtrates of *T. koningi* as affected by both pH values and time of reaction.

pH	Time of Reaction (min.)							Mean
	5	10	30	50	80	120	180	
4.0	25.9	52.0	71.5	74.6	77.7	78.8	79.8	65.76
4.6	27.1	62.9	73.0	76.6	79.5	80.2	81.9	68.74
5.0	29.5	64.2	75.0	77.3	82.2	83.2	83.7	70.73
5.6	35.1	67.4	76.2	81.9	84.1	85.7	86.3	73.81
6.0	37.5	68.3	79.5	83.7	86.3	87.9	89.4	76.09
6.6	41.7	70.9	80.3	85.0	88.2	91.3	93.7	78.73
7.0	31.1	64.9	79.3	84.9	86.8	89.2	89.4	75.09
7.6	28.6	63.1	78.3	81.6	84.8	87.9	88.1	73.20
8.0	26.6	60.8	75.8	79.8	80.4	85.5	85.1	70.57
8.6	21.2	58.8	74.6	76.4	79.2	81.6	81.2	67.57
Mean	30.43	63.33	76.35	80.18	82.92	85.13	85.86	72.03

L.S.D. at 5% for:	pH value (P)	Time (T)	P x T
	0.57	0.47	1.50

Table (24): Cellulolytic enzymes activities in cultural filtrates of *A. glaucus* as affected by both pH values and time of reaction.

	Time of Reaction (min.)							
pH	5	10	30	50	80	120	180	Mean
4.0	28.5	61.8	74.2	76.8	78.1	81.6	84.3	69.33
4.6	42.8	71.4	78.7	79.2	80.7	84.0	86.3	74.73
5.0	45.8	71.8	79.7	80.3	83.0	86.4	88.1	76.44
5.6	51.6	75.0	81.6	83.1	85.6	87.4	90.6	79.27
6.0	61.5	76.9	84.6	92.3	92.3	100.0	100.0	86.80
6.6	60.0	72.3	79.1	83.5	85.7	93.2	94.1	81.13
7.0	35.1	55.5	77.7	79.1	83.6	87.9	91.5	72.91
7.6	31.8	55.5	66.6	77.7	82.8	86.2	90.3	70.13
8.0	28.3	50.5	60.7	65.8	80.3	84.6	87.5	65.39
8.6	24.3	42.5	59.1	60.5	77.5	80.5	83.3	61.10
Mean	40.97	63.32	74.2	77.83	82.96	87.18	89.6	73.72

L.S.D. at 5% for:	pH value (P)	Time (T)	P x T
	0.98	1.17	3.1

Table (25): Cellulolytic enzymes activities in cultural filtrates of *B. theobromae*, *T. album*, *T. koningi* and *A. glaucus* as affected by pH values in mixture reaction.

	Fungi				
pH	*B. theobromae*	*T. album*	*T. koningi*	*A. glaucus*	Mean
4.0	73.27	49.63	65.76	69.33	64.50
4.6	80.10	53.91	68.74	74.73	69.37
5.0	83.00	58.70	70.73	76.44	72.22
5.6	84.81	63.67	73.81	79.27	75.39
6.0	88.54	68.49	76.09	86.80	79.98
6.6	92.19	72.99	78.73	81.13	81.26
7.0	87.2	70.24	75.09	72.91	76.36
7.6	84.26	65.89	73.20	70.13	73.37
8.0	76.73	61.67	70.57	65.39	68.59
8.6	68.43	57.86	67.57	61.10	63.74
Mean	81.85	62.31	72.03	73.72	

Effect of some fungicides on the linear growth:

Data in **Table (26 a, b, c & d)** indicated that, the linear growth of the tested wood deteriorating fungi were greatly affected by the different used fungicides. Regardless fungi, the lowest average of linear growth of all tested fungi was produced by using the fungicide Benlate (1.93 mm), followed by Topsin-M (10.48 mm), Ridomil (11.23 mm), Rovral (12.65 mm), Rizolix-T (16.83 mm), Bayleton (22.88 mm), and Trimeltox-fort (25.43 mm) compared with control (90.0 mm). Concerning with fungi, the same data state also that the linear growth of *B. theobromae* was the most affected by the used fungicides (21.11 mm) followed by *T. koningi* (22.31), *T. album* (23.01 mm), while growth of *A. glaucus* was the least affected (28.26 mm). From data in **Table (22)** it could be notice that Benlate was completely suppressed linear growth at 5 ppm for *B. theobromae*, *T. koningi*, and *T. album*, and at 10 ppm for *A. glaucus*. Topsin-M exhibited complete growth stopping at 25 ppm for *B. theobromae*, at 50 ppm for *T. koningi*, and *T. album*, and at 100 ppm for *A. glaucus*. Ridomil stopped growth of the first three fungi at 50 ppm and at 100 ppm for the forth one. However Bayleton and Trimeltox-fort suppressed growth of all tested fungi at 1000 ppm.

Table (26 a): Effect different concentrations of some fungicides on linear growth (in mm) of *Botryodiplodia theobromae.*

	Concentrations in ppm									
Fungicides	2	5	10	25	50	100	500	1000	10000	Mean
Benlate	21	0	0	0	0	0	0	0	0	2.3
Rizolex-T	51	31	17	12	8	0	0	0	0	13.2
Topsin-M	34	19	8	0	0	0	0	0	0	6.8
Bayleton	56	41	25	13	8	0	0	0	0	15.9
Trimeltox-	60	47	28	19	10	8	0	0	0	19.1
Rovral	45	28	15	9	8	0	0	0	0	11.7
Ridomil	41	25	14	9	0	0	0	0	0	9.9
Control	90	90	90	90	90	90	90	90	90	90.0
Mean	49.8	35.1	24.6	19.0	15.5	12.3	11.3	11.3	11.3	21.1

L.S.D. at 5% for: Fungicide (F) 3.8 Concentration (C) 4.1 F x C 11.5

Table (26 b): Effect different concentrations of some fungicides on linear growth (in mm) of *Trichoderma koningi.*

	Concentrations in ppm									
Fungicides	2	5	10	25	50	100	500	1000	10000	Mean
Benlate	1.3	0	0	0	0	0	0	0	0	0.1
Rizolex-T	41	31	23	14	9	8	0	0	0	14.0
Topsin-M	38	25	12	8	0	0	0	0	0	9.2
Bayleton	58	47	34	22	14	11	8	0	0	21.6
Trimeltox-	74	51	38	24	16	10	8	0	0	24.6
Rovral	41	29	13	9	0	0	0	0	0	10.2
Ridomil	31	29	12	7	0	0	0	0	0	8.8
Control	90	90	90	90	90	90	90	90	90	90.0
Mean	46.8	37.8	27.8	21.8	16.1	14.9	13.3	11.3	11.3	22.3

L.S.D. at 5% for: Fungicide (F) 4.4 Concentration (C) 4.7 F x C 13.3

Table (26 c): Effect different concentrations of some fungicides on linear growth (in mm) of *Aspergillus glaucus*.

	Concentrations in ppm									
Fungicides	2	5	10	25	50	100	500	1000	10000	Mean
Benlate	27	10	0	0	0	0	0	0	0	4.1
Rizolex-T	69	42	31	23	17	8	0	0	0	21.1
Topsin-M	56	41	28	19	9	0	0	0	0	17.0
Bayleton	72	59	44	31	19	9	7	0	0	26.8
Trimeltox-	78	61	47	33	20	9	8	0	0	28.4
Rovral	60	51	34	21	12	8	0	0	0	20.7
Ridomil	59	47	30	18	8	0	0	0	0	18.0
Control	90	90	90	90	90	90	90	90	90	90.0
Mean	63.9	50.1	38.0	29.4	21.9	15.5	13.	11.3	11.3	28.3

L.S.D. at 5% for:	Fungicide (F)	Concentration (C)	F x C
	4.1	4.4	12.4

Table (26 d): Effect different concentrations of some fungicides on linear growth (in mm) of *Trichoderma album*.

	Concentrations in ppm									
Fungicides	2	5	10	25	50	100	500	1000	10000	Mean
Benlate	11	0	0	0	0	0	0	0	0	1.2
Rizolex-T	53	41	35	22	11	9	0	0	0	19.0
Topsin-M	35	24	13	8	0	0	0	0	0	8.9
Bayleton	68	57	43	35	21	12	9	0	0	27.2
Trimeltox-	71	61	47	39	25	14	9	0	0	29.6
Rovral	32	21	11	8	0	0	0	0	0	8.0
Ridomil	34	21	11	8	0	0	0	0	0	8.2
Control	90	90	90	90	90	90	90	90	90	90.0
Mean	49.3	39.4	31.3	26.3	18.4	15.6	13.5	11.3	11.3	24.0

L.S.D. at 5% for:	Fungicide (F)	Concentration (C)	F x C
	4.3	4.6	13.0