RESULTS

RESULTS

1. Isolated fungi from decayed mango fruits and die-backed branches of mango, peach and pear

Mango fruit rot, spiecially stem-end rot and die back disease has a great importance on mango where it caused a big loss in the production of mango fruits before and post harvesting. As shown in Table (3) there were many isolates of fungi were isolated from different parts of mango and die-backed branches of peach and pear. The highest frequency was ***B. theobromae*** where it was isolated from all isolated parts followed by ***Fusarium*** spp., ***Alternaria*** spp., ***Aspergillus niger***, ***Epicoccum*** spp., ***Nigrospora*** spp. and un-identified fungi were also isolated from infected fruits and had no high frequency.

Identification of the isolated fungi was carried out in accordance to description given by GILMAN (1957) and confirmed by Phytopathology Institute of Mycology, Justus-Liebig Univ.,Giessen, Germany (1993).

2. Pathogenicity Tests

Two cultivars of mango cvs. Pyri and Taimour were used in this study. Pathogenicity were carried out by covering the wounded and un-wounnded fruits with spore suspenion ($2x10^4$ spore/ml) of each isolate alone. Readings were obtained after 2, 3, 4 and 5 days after inoculation. Fruits at different stages of maturity were used in this experement as follows :

A-Rapid growth stage (about 50 days after fruit setting).

B-Pre-ripening stage (about 80 days after fruit setting).

C-Ripening stage (about 110 days after fruit setting).

D-Mature ripening stage (about 130 days after fruit setting).

Table (3) Isolated fungi from decayed mango fruits and die-backed branches of mango, peach and pear.

Isolated fungi	Isolated parts					
	Decayed mango fruit A	Decayed mango fruit B	Decayed mango fruit C	Die-backed mango branches	Die-backed peach branches	Die-backed cankered pear branches
B. theobromae	+	+	+	+	+	+
Alternaria alternata	+	+	-	-	-	-
Alternaria spp.	+	+	+	-	+	+
F. moniliforme	+	+	-	-	+	-
Fusarium spp.	+	+	+	+	+	+
Aspergillus niger	+	-	-	-	-	-
Nigrospora spp.	-	-	-	-	+	-
Epicoccum spp.	-	-	-	-	+	+
Other un-identified fungi	+	+	+	+	+	+

2.1 Rating of disease incidence on cv. Pyri at different growth stages after artificial inoculation

2.1.1 Rapid growth stage

Results presented in Table (4) show that un-wounded fruits showed no rotting symptoms of all inoculated fruits, only slight rotting about 3.3% was obtained on the un-wounded fruits inoculated by ***B. theobromae*** (PrB isolated from die-backed cankered pear branches) isolate. On the other hand, wounded fruits showed different symptoms of rot. The first symptoms of rot appear 2 days after incuolation as 35, 20 and 15% when infected by ***B. theobromae*** MB, PB and PrB respectively. The size of rotted lesion extented rapidly after 3-5 days to reach 100% of the fruits inoculated by ***B. theobromae*** isolates while ***F. moniliforme*** gave only 18.3% after 5 days incubation.

2.1.2 Pre-ripening stage

Results presented in the same Table (4) indicate that un-wounded fruits showed rotting symptoms after 4 days incubation of the inoculated fruits by ***B. theobromae*** isolates to reach 40% after 5 days incubation of un-wounded fruits inoculated by ***B. theobromae*** (PB) isolate while no rotting symptoms were recorded on controls or inoculated ones by ***F. moniliforme*** isolate. Infected wounded fruits showed different symptoms of rot appear 2 days after inoculation as 17.5, 12.5 and 7.5% when inoculated by ***B. theobromae*** MB, PrB and PB respectively. The size of rotted lesion extented rapidly after 3-5 days to reach 100% of the fruits inoculated by ***B. theobromae*** isolates while ***F. moniliforme*** gave only 22.5% after 5 days incubation.

Table (4): Rating of disease incidence on cv. Pyri at different growth stages after artificial inoculation.

Treatments		Rapid growth stage 50 d.a.s				Pre- ripening stage 80 d.a.s.				Ripening stage 110 d.a.s.				Mature ripening stage 130 d.a.s.			
d. p. i.		2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
MB	w.	35.0	66.7	100.0	100.0	17.5	65.0	100.0	100.0	17.5	40.0	90.0	100.0	10.0	32.5	65.0	90.0
MB	un-w.	0.0	0.0	0.0	0.0	0.0	0.0	5.0	22.5	0.0	0.0	5.0	15.0	2.5	12.5	25.0	35.0
PB	w.	20.0	66.7	96.7	100.0	7.5	40.0	87.5	100.0	5.0	15.0	32.5	75.0	2.5	22.5	57.5	72.5
PB	un-w.	0.0	0.0	0.0	0.0	0.0	0.0	10.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PrB	w.	15.0	56.7	96.7	100.0	12.5	47.5	95.0	100.0	5.0	10.0	35.0	70.0	0.0	16.3	50.0	72.5
PrB	un-w.	0.0	0.0	0.0	3.3	0.0	0.0	0.0	15.0	0.0	0.0	5.0	10.0	0.0	7.5	15.0	25.0
MF	w.	0.0	0.0	6.7	18.3	0.0	2.5	12.5	22.5	0.0	6.3	15.0	25.0	0.0	2.5	10.0	15.0
MF	un-w	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	10.0	15.0
Con.	w.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	8.8	10.0
Con.	un-w	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.8	15.0	20.0
Tukey-HSD 5% >=		6.42	5.48	2.5	4.42	9.19	1.83	5.23	12.68	1.29	4.95	5.31	8.47	1.29	5.78	7.98	9.29

*MB=*B. theobromae* (mango isolate)
*PB=*B. theobromae* (peach isolate)
*PrB=*B. theobromae* (pear isolate)
*MF=*F. moniliforme* (mango isolate)
*W=wounded fruits
*Un-w=un-wounded fruits
*d.a.s.=days after fruit set
*d.p.i.=days post inoculation

2.1.3 Ripening stage

Data presented in Table (4) also indicate that un-wounded fruits showed rotting symptoms after 4 days incubation only of inoculated fruits by *B. theobromae*, (MB) and (PrB) isolates to reach 15 and 10% respectively after 5 days incubation, while, wounded ones showed different symptoms of rot. The first symptoms appear 2 days after inoculation as 17.5 and 5% when infected with *B. theobromae* MB, PB and PrB respectively. The size of rotted lesions were extented rapidly to reach 100% of the whole fruit inoculated by *B. theobromae* (MB) isolate while *F. moniliforme* gave only 25% after 5 days incubation.

2.1.4 Mature ripening stage

Results presented in the same Table (4) and illustrated by Fig. (2, 3) show that un-wounded fruits showed rotting symptoms of inoculated fruits. The first symptoms appear 2 days after inoculation as 2.5% of fruits inoculated by *B. theobromae* (MB) to reach 35% after 5 days incubation as well as different rotting symptoms were recorded in this stage of un-wounded fruits on controls and inoculated by the other isolates except PB isolate. Inoculated wounded ones showed also different symptoms of rot. The first symptoms appear after 2 days incubation as 10 and 2.5% when infected by *B. theobromae* (MB) and (PB) respectively. The size of rotted lesion extented rapidly after 3-5 days to reach 90% after 5 days incubation of the fruit by *B. theobromae* (MB) while *F. moniliforme* gave only 15% after 5 days incubation.

2.2. Rating of disease incidence on cv. Taimour at different growth stages after artificial inoculation

2.2.1 Rapid growth stage

Results presented in Table (5) indicate that un-wounded fruits showed no rotting symptoms while wounded ones showed different symptoms of rot. The first symptoms appear 2 days after inoculation as 12.7, 11.7, 10 and 2.0 % when infected by ***B. theobromae*** PB, MB, PrB and ***F. moniliforme*** respectively. The size of rotted lesion extented rapidly after 3-5 days to reach 100 % of the fruit by ***B. theobromae*** while ***F. moniliforme*** gave only 13.3 % after 5 days incubation.

Table (5): Rating of disease incidence on cv. Taimour at different growth stages after artificial inoculation.

Treatments		Rapid growth stage 50 d.a.s.				Pre- ripening stage 80 d.a.s.				Ripening stage 110 d.a.s.				Mature ripening stage 130 d.a.s.			
d. p. i.		2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
MB	w.	11.7	63.3	93.3	100.0	6.3	65.0	97.5	100.0	12.5	47.5	100.0	100.0	22.5	42.5	75.0	95.0
MB	un-w.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	3.8	20.0	27.5	35.0
PB	w.	12.7	46.7	83.3	93.3	4.3	32.5	82.5	97.5	6.3	13.8	65.0	85.0	10.0	37.5	65.0	82.5
PB	un-w.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	7.5	25.0	37.5	45.0
PrB	w.	10.0	53.3	86.7	96.7	5.3	57.5	95.0	100.0	5.0	13.8	70.0	92.5	5.0	17.5	55.0	75.0
PrB	un-w.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	3.8	7.5	7.5
MF	w.	2.0	2.0	8.3	13.3	1.3	2.0	7.5	20.0	1.3	3.8	15.0	25.0	2.5	10.0	17.5	25.0
MF	un-w	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0.0	0.0	0.0	0.0	2.5	10.0	15.0	21.5
Con.	w.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	2.5	5.0
Con.	un-w	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	8.8	17.5
Tukey-HSD 5% >=		2.78	6.34	3.23	2.50	1.83	7.38	4.23	10.29	1.65	2.98	4.38	5.70	4.22	8.05	11.29	13.81

*MB=*B. theobromae* (mango isolate)
*PB=*B. theobromae* (peach isolate)
*PrB=*B. theobromae* (pear isolate)
*MF=*F. moniliforme* (mango isolate)
*W=wounded fruits
*Un-w=un-wounded fruits
*d.a.s.=days after fruit set
*d.p.i.=days post inoculation

Fig. (2) Show the artificial infection of wounded mango fruits cvs. Pyri and Taimour at mature ripening growth stage. P = Pyri, T = Taimour, (1) control, (2) inoculated with *B. theobromae* (Mango isolate), (3) inoculated with *B. theobromae* (Peach isolate), (4) inoculated with *B. theobromae* (Pear isolate) and (5) inoculated with *F. moniliformae* (Mango isolate).

Fig. (3) Show the artificial infection of un-wounded mango fruits cvs. Pyri and Taimour at mature ripening growth stage. P = Pyri, T = Taimour, (1) control, (2) inoculated with *B. theobromae* (Mango isolate), (3) inoculated with *B. theobromae* (Peach isolate), (4) inoculated with *B. theobromae* (Pear isolate) and (5) inoculated with *F. moniliformae* (Mango isolate).

un-wounded and wounded control fruits. Infected wounded fruits at this age were rotted rapidly after 2-5 days from inoculation to reach 95% of the whole fruit after 5 days incubation. The most severe isolate was also ***B. theobromae*** (MB), ***B. theobromae*** (PB) and ***B. theobromae*** (PrB), then the lastly 25% ***F. moniliforme*** (MF) isolate.

3. Symptoms of The Disease

It has been showed in Egypt that the causal organism of stem-end rot and fruit rot is ***B. theobromae*** . Symptoms appear on the fruit as a soft dark brown lesion, typically at the stem-end. Mature lesions may show minute black bodies (pycnidia) projecting through the skin, and microscopic examination of these parts is necessary for identification of the causal fungus. The samefungus able to produce a dark brown to black lesion with a clearly defined margins anywhere on the fruit. Decayed tissue is soft and moistend. It`s possible to see the mycellium of the fungus between grey and white colour on the decayed skin at the high relative humidity. The disease spreads quicklly inside the fruit causing maceration of cells through 4 to 5 days. Fig. (4,5 & 6) show the rotting symptoms.

4. Factors affecting disease severity

4.1. Effect of wounding

4.1.1 Effect of different wound levels on disease incidence of Pyri mango fruits cv. infected with pathogenic fungi

Data in Table (6) show that *F. moniliforme* isolate has slight action to invade mango fruits at the different wounds levels where the infection stayed

Fig. (4) Show the natural rotting symptoms on mango fruits cvs. Pyri and Taimour which caused by *B. theobromae*. P= Pyri and T= Taimour.

Fig. (5) Show the maceration and discolouration in the internal tissues of diseased mango fruits cv. Pyri compared with healthy ones

Fig. (6) Show the artificial symptomes of wounded and un-wounded mango fruits cvs. Pyri and Taimour at mature ripening growth stage and inoculated with *B. theobromae* (Mango isolate). P = Pyri, T = Taimour, (1) Control un-wounded, (2) Control wounded, (3) Inoculated un-wounded fruits (4) Inoculated wounded fruits.

Table (6): Effect of different wounds levels on disease incidence of Pyri mango fruits cv. infected with the pathogenic fungi.

Treatments	*B. theobromae* (MB)				*B. theobromae* (PB)				*B. theobromae* (PrB)				*F. moniliforme* (MF)			
d. p. i.	2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
Superficial w.	0.0	7.5	60.0	95.0	0.0	0.0	6.3	35.0	1.75	11.3	23.8	70.0	0.0	0.0	0.0	0.0
Needle deep w.	2.0	16.3	85.0	100.0	0.0	5.0	22.5	75.0	3.8	8.8	42.5	92.5	0.0	0.0	0.0	0.0
3mm cyclic w	12.5	77.5	100.0	100.0	5.0	22.5	85.0	100.0	5.8	35.0	82.5	97.5	0.0	0.0	0.0	0.0
5mm long deep w.	7.5	50.0	100.0	100.0	2.5	11.3	42.5	92.5	6.3	35.0	80.0	100.0	0.0	0.0	0.0	0.0
10mm long deep w	17.5	95.0	100.0	100.0	0.0	40.0	87.5	100.0	12.5	47.5	95.0	100.0	0.0	2.5	12.5	25.0
Un-wounded fruits	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tukey-HSD 5% >=	1.99	4.62	5.00	1.66	0.17	1.61	5.25	6.40	2.39	3.77	6.28	3.91	ns	0.83	0.83	1.7

*MB=mango isolate
*PB=peach isolate
*PrB=pear isolate
*MF=mango isolate
*d.p.i.=days post inoculation

0.0% at the different incubation periods while at 10mm long deep wound recorded the infection to be 25% after 5 days incubation. On the othe hand the rotting symptoms were recorded at all treatments incoculated with ***B. theobromae*** isolates where the highest infection was recorded at 10mm long deep wounded fruits to reach 100% by ***B. theobromae*** MB, PB and PrB isolates after 5 days incubation, followed by 3mm cyclic wounded fruits where the rotted lesions reached 100% by MB and PB isolates at the same incubation period. The inoculated fruits at 5mm long deep wound inoculated with PrB isolate to be 100% after 5 days incubation. The lowest infection was recorded on the superficial wounded fruits as 95, 35 and 70% by MB, PB and PrB isolates respectively after 5 days incubation. The evidence on disease severity was taken from the gradualy evaluation of infection through different incubation periods where the infection was evaluated slowly on superficial wounded fruits with all pathogenic ***B. theobromae*** isolates but the infection spreaded quickly on each of 10mm long deep wounded fruits followed by 3mm cyclic wounded fruits and 5mm long deep wounded fruits with significant differences between the treatments at the different incubation periods. On the other hand, no rotting symptoms were recorded on un-wounded fruits inoculated with the same fungi at the different incubation periods.

4.1.2 Effect of different wound levels on disease incidence of Taimour mango fruits cv. infected with the pathogenic fungi

Results shown in Table (7) show that there was no infection was recorded also on wounded cv.Taimour fruits inoculated with ***F. moniliforme*** isolate at all wound levels except at 10mm long deep wounded fruits where the

Table (7): Effect of different wound levels on disease incidence of Taimour mango fruits cv. infected with the pathogenic fungi.

Treatments	*B. theobromae* (MB)				*B. theobromae* (PB)				*B. theobromae* (PrB)				*F. oxysporum* (MF)			
d. p. i.	2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
Superficial w.	4.3	15.0	55.0	75.0	0.0	0.0	2.5	15.0	1.8	2.0	2.5	20.0	0.0	0.0	0.0	0.0
Needle deep w.	2.5	13.8	60.0	90.0	2.0	4.5	16.3	60.0	2.5	2.5	20.0	50.0	0.0	0.0	0.0	0.0
3mm cyclic w	5.0	17.5	77.5	92.5	3.8	4.5	30.0	60.0	7.5	13.8	47.5	80.0	0.0	0.0	0.0	0.0
5mm long deep w.	3.5	37.5	77.5	95.0	3.0	6.8	30.0	60.0	3.8	12.5	55.0	87.5	0.0	0.0	0.0	0.0
10mm long deep w	6.3	65.5	97.5	100.0	4.8	32.5	82.5	87.5	11.3	57.5	95.0	100.0	1.3	2.0	7.5	20.0
Un-wounded fruits	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tukey-HSD 5% >=	1.4	8.4	10.2	9.8	1.1	5.0	8.4	10.7	2.6	8.1	13.0	13.6	0.4	0.7	1.4	4.1

*MB= mango isolate
*PB= peach isolate
*PrB= pear isolate
*MF= mango isolate
*d.p.i. =days post inoculation

infection reached 20% after 5 days incubation and evaluated very slowly on the fruits. On the other hand, the lowest infection was recorded on superficial wounded fruits with ***B. theobromae*** (PB) to be 15% after 5 days incubation while the highest infection was obtained at 10mm long deep wounded fruits,to reach 100, 87.5 and 100% by ***B. theobromae*** MB, PrB and PB isolates after the same incubation period.. The significant differences were recorded between the treatments at the different incubation periods of all tested isolates. On the other hand no rotting symptoms were recorded on un-wounded fruits inoculated with ***B. theobromae*** isolates and ***F. moniliforme***.

4.2. Effect of inoculum density levels of fungi on disease incidence on wounded mango fruits

Data presented in Table (8) show that at the different inoculum densities recorded rotting symptoms but the highest infection was recorded at the concentration 2.0 x 10^4 spore/ml comparatively with the other concentrations of spore suspension on wounded Pyri fruits cv. after 5 days incubation of all pathogenic isolates where the infection reached 95 and 97.5% by ***B. theobromae*** MB, PrB and PB isolates respectively without significant difference between them while the same concentration of ***F. moniliforme*** spore suspension recorded the lowest infection 16.25% with significant difference to the other ones. Similar results were obtained on wounded Taimour fruits cv. at the concentration $2.0x10^4$ spore/ml where the rotting symptoms reached 97.5 , 90.0 and 87.5% by ***B. theobromae*** MB, PrB and PB isolates respectively after the same incubation period with significant difference between them.

Table (8): Effect of inoculum density levels of fungi on disease incidence on wounded mango fruits

Isolates	Inoculum	cv. Taimour				cv. Pyri			
d. p. i.	spore/ml	2	3	4	5	2	3	4	5
Control (without inoculation)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B. theobromae (MB)	$1.0x10^4$	7.5	14.25	60.0	87.5	4.25	9.5	45.0	70.0
	$1.5x10^4$	9.25	15.0	60.0	87.5	5.0	11.25	40.0	72.5
	$2.0x10^4$	15.50	35.0	77.5	97.5	15.0	32.5	75.0	95.0
B. theobromae (PB)	$1.0x10^4$	4.5	8.75	40.0	80.0	5.5	15.0	47.5	80.0
	$1.5x10^4$	4.5	8.75	40.0	87.8	7.5	15.0	52.5	92.5
	$2.0x10^4$	7.5	20.0	57.0	87.5	15.0	35.0	75.0	97.5
B. theobromae (PrB)	$1.0x10^4$	2.0	5.0	35.0	77.5	2.5	7.5	30.0	80.0
	$1.5x10^4$	2.0	5.0	37.5	80.0	5.0	17.5	30.0	90.0
	$2.0x10^4$	10.0	22.5	55.0	90.0	10.0	30.0	55.0	95.0
F. moniliforme (MF)	$1.0x10^4$	0.0	0.5	2.5	5.0	0.0	0.5	2.25	15.0
	$1.5x10^4$	0.0	0.5	2.5	5.0	0.0	0.5	3.0	15.0
	$2.0x10^4$	0.0	1.0	2.5	10.0	0.0	1.25	3.0	16.5
*Tukey-HSD 5% concen. 1 >=		1.65	3.28	7.00	8.29	2.62	3.54	7.04	4.6
*Tukey-HSD 5% concen. 2 >=		0.64	0.95	2.04	4.79	2.70	4.07	8.88	8.17
*Tukey-HSD 5% concen. 3 >=		3.46	5.30	7.29	4.56	2.89	4.74	9.39	6.27

*MB= Mango isolate
*PB= peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*Age of fruits about 50 days from fruit set.

On the other hand, the same concentration of *F. moniliforme* spore suspension recorded the lowest infection 10% after 5 days incubation with significant difference to the other pathogenic isolates.

5. Host range

Disease incidence % on Taimour and Pyri mango fruits cvs., Peach and Pear inoculated with different pathogenic fungi.

Data in Table (9) show that no infection was recorded on all of un-wounded fruits (pyri, taimour and pear) only on un-wounded peach fruits was recorded the rotting symptoms after 2 days incubation to be 12.5, 8.8, 3.8 and 7.5% by *B. theobromae* PB, MB and PrB isolates and *F. moniliforme* isolate respectively. While at the same incubation time recorded rotting symptoms at all of wounded inoculated peach fruits. After 3 days incubation of the different fruit varieties, the infection was spreaded quickly on wounded taimour, pyri, peach and pear fruits inoculated with *B. theobromae* MB isolate to be 47.5, 40, 52.5 and 70% respectively with significant differences to the other isolates while no infection were recorded on cvs taimour and pyri after the same incubation period but the highest infection 32.5% was recorded with PB isolate on un-wounded peach fruits. After 4 days incubation of wounded fruits recorded *B. theobromae* MB isolate the highest infection to be 100, 90, 95 and 77.5% on taimour and pyri cvs., pear and peach respectively with significant differences to the other ones. On un-wounded fruits recorded only the infection on cv. pyri 5% by MB and PrB isolates after 4 days icubation as well as, extented the rotting symptoms on all of un-wounded peach fruits inoculated with pathogenic isolates. After 5 days incubation of the different fruits recorded

Table (9) Disease incidence % on fruits of mango,cvs.Taimour and Pyri, Peach and Pear inoculated with different pathogenic fungi.

Treatments		2 d. p. i.				3 d. p. i.				4 d. p. i.				5 d. p. i.			
		Taim.	Pyri	Peach	Pear	Taim.	Pyri	Peach	Pear	Taim.	Pyri	Peach	Pear	Taim.	Pyri	Peach	Pear
MB	**w.**	12.5	17.5	30.0	3.5	47.5	40.0	52.5	70.0	100.0	90.0	77.5	95.0	100.0	100.0	100.0	100.0
MB	**un-w.**	0.0	0.0	8.8	0.0	0.0	0.0	18.8	0.0	0.0	5.0	42.5	0.0	17.5	15.0	100.0	5.0
PB	**w.**	6.3	5.0	11.3	10.0	13.8	15.0	28.8	40.0	65.0	32.5	37.5	82.5	85.0	75.0	77.5	100.0
PB	**un-w.**	0.0	0.0	12.5	0.0	0.0	0.0	32.5	0.0	0.0	0.0	37.5	0.0	0.0	0.0	77.5	0.0
PrB	**w.**	5.0	5.0	2.5	1.3	13.8	10.0	12.5	5.0	70.0	35.0	21.3	12.5	92.5	70.0	60.0	35.0
PrB	**un-w.**	0.0	0.0	3.8	0.0	0.0	0.0	16.5	0.0	0.0	5.0	21.3	0.0	0.0	10.0	47.5	0.0
MF	**w.**	1.3	0.0	2.5	0.0	3.8	6.3	11.3	2.5	15.0	15.0	17.5	7.5	25.0	25.0	40.0	17.5
MF	**un-w.**	0.0	0.0	7.5	0.0	0.0	0.0	16.5	0.0	0.0	0.0	27.5	0.0	0.0	0.0	50.0	0.0
Con.	**w.**	0.0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Con.	**un-w.**	0.0	0.0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
*Tukey-HSD 5% >=		1.6	2.1	3.8	2.9	2.9	4.4	6.4	3.6	4.4	5.5	8.2	3.5	5.7	9.3	7.1	7.4

*MB=*B.theobromae* (mango isolate)
*PB=*B. theobromae* (peach isolate)
*PrB=*B. theobromae* (pear isolate)
*MF= *F. moniliforme* (mango isolate)
*W.= Wounded fruits
*Un-w.= Unwounded fruits
*d.p.i.=days post inoculation

100% infection on wounded inoculated taimour, pyri cvs., peach and pear with MB isolate but it seems to be that ***B. theobromae*** and ***F. moniliforme*** isolates were able to infect wounded and un-wounded peach fruits where the infection was ranged between 40 to 100% on the fruits. On the other hand it is clear that ***B. theobromae*** were capable also to invade the wounded fruits of taimour, pyri cvs. and pear but they has a slight action to infect un-wounded fruits of the same varieties.

6. Physiological Studies

6.1 Nutrition

6.1.1 Effect of different media on linear growth and sporulation of *B. theobromae* isolates and *F. moniliforme.*

Data presented in Table (10) clearly show that ***B. theobromae*** isolates were able to grow on most of the tested media. The highest average of linear growth were obtained on PDA for the three ***B. theobromae*** isolates (MB, PB and PrB respectively) after two days, followed by Czapek's Dox, malt extract and Richard media. While the lowest average linear growth, occurred on Barnes and Richard media. Data indicated that there were significant differences between different media and thier effect on the nutrition of the test fungi.

Data presented in Table (11) show that Czapek`s Dox was the most favourable media for the formation of pycnidia of ***B. theobromae*** (MB) isolate being 676,0 pycnidia/culture plate followed by Richard 618.0 pycnidia/plate. While for isolate (PB) Conn's medium 785.0 pycnidia/culture plate followed by Malt extract 655.0 pycnidia/plate , PDA 603.0 pycnidia/plate and Brawn

Table (10): Effect of Media on Linear growth (mm) of pathogenic isolates of ***B. theobromae*** Pat. and ***F. moniliforme***.

Type of Media	*B. theobromae* (MB)		*B.theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
Richard	55	90	58	90	21	64	11	51
Barns	30	66	41	75	35	71	14	29
Brawn	38	69	43	73	35	65	13	26
Conn	51	90	62	90	50	90	17	41
Czapek's Dox	68	90	60	90	51	90	18	37
P. D. A.	75	90	77	90	51	90	15	35
Malt. Ex.	55	90	66	90	45	90	11	22
Peptone dex.	46	85	49	79	38	85	14	28
Mango Ex.	51	83	53	85	31	74	16	32
Plain Agar	26	54	39	73	30	71	16	31
Tukey-HSD 5%>=	0.529	0.383	0.350	0.212	0.320	0.320		

Table (11): Effect of Media on pycnidial formation and sporulation of pathogenic isolates of ***B. theobromae*** Pat. and ***F. moniliforme***.

Type of Media	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF) spore/ml
d.p.i.	6	9	6	9	6	9	7
Richard	591.0	618.0	0.0	202.5	20.8	35.5	$15.45x10^4$
Barns	34.5	83.7	3.3	108.3	14.8	56.5	$4.90x10^4$
Brawn	476.0	602.5	211.0	485.0	208.0	703.0	$15.50x10^4$
Conn	339.0	420.5	443.0	785.0	485.2	686.5	$7.025x10^4$
Czapek,s Dox	589.0	676.0	3.0	170.0	108.0	667.5	$11.925x10^4$
P. D. A.	224.0	418.0	79.0	603.0	67.8	446.0	$14.275x10^4$
Malt. Ex.	81.5	106.1	97.5	655.0	264.0	710.5	$7.250x10^4$
Peptone dex.	53.7	73.5	56.0	92.0	51.3	174.0	$2.925x10^4$
Mango Ex.	233.0	253.0	0.0	109.5	9.3	39.0	$0.250x10^4$
Plain Agar	67.0	85.0	0.0	0.0	0.0	12.8	$0.750x10^4$
Tukey-HSD 5%>=	63.17	62.20	39.56	71.17	39.72	80.72	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.=Days post inoculation

485.0 pycnidia/plate respectively. While the best medium for pycnidial formation of PrB isolate was Malt extract,(710.5 pycnidia/plate) followed by Brawn media 703.0 pycnidia/plate .

On the other hand, Barns and Peptone dex. media yielded the lowest average number of (MB and PB) ***B. theobromae*** isolates, but Mango extract medium was favourable for pycnidial formation of (MB isolate 253.0 pycnidia/plate) and un-favourable for the other isolates (PB 109.5 and PrB 39.0 pycnidia/plate) whereas, Malt extract medium was un-favourable for (MB isolate 106.1 pycnidia/plate) and favourable for the other isolates as mentioned before. The average number of pycnidia formed by ***B. theobromae*** MB isolate was greatly increased by increasing the incubation period from 6-9 days. It was remarked that more of the pycnidia on Conn`s and Brawn`s media were very small and sterile.

Results shown in Table (10-11) indicate that ***F. moniliforme*** isolated from decayed mango was able to grow on the same different media, the perferable media for the fungus were after 4 days, Richard, Conn, Czapek's and PDA where the average of linear growth 51, 41, 37 and 35 mm. respectively. It was also clear from the data that Brawn, Richard, PDA and Czapek's media were the best favourable media for sporulation of ***F. moniliforme*** isolate after 7 days whereas, Peptone dex., Mango extract and Plain agar yielded the lowest number of spores after 7 days incubation.

6.1.2 Effect of Carbon sources on linear growth and sporulation of *B. theobromae isolates* and *F. moniliforme.*

Data presented in Table (12) show that ***B. theobromae*** isolats use many different carbon sources in nutrition such as starch, dextrin, glycerol, mannose,

maltose, galactose, lactose, fructose. Glucose and sucrose were the best carbon sources for linear growth of all ***B. theobromae*** isolates (40, 70, 43 mm and 40, 65, 42 mm, respectively), while mannose and glycerol were the lowest favourable for growth of (MB) isolate after two days whereas, it was clear that starch, dextrin, fructose, lactose and maltose had moderate effect on growth of the same isolate after two and four days.

These carbon sources were favourable for growth of (PB) isolate after the same incubation time and have moderate effect on the growth of (PrB) isolate. The incubation periods significantly affected the growth of the ***B. theobromae*** isolates after two and four days.

It is clear from the results presented in Table (13) that sucrose was the best carbon source for pycnidial formation of all ***B. theobromae*** isolates (MB, PB and PrB) 626.7, 420.0 and 598.7 respectivly. It was followed by dextrin, frutose, mannose and glucose for (MB) isolate, 302.7 , 301.3 , 256.0 , and 180.7 respectivly and the isolate failed to form any of pycnidium on Czapek`s medium which contain maltose as a carbon source. Therefore, galactose, glycerol, and lactose were poor carbon sources for pycnidial formation of the same isolate 4.7, 57.3, and 58.3 pycnidia/plate. Dextrin, mannose, fructose and glycerol were the best carbon sources for producing pycnidia of (PB) isolate 406.7, 346.7, 340.0, and 246.7 pycnidia/plate respectivly. Glucose, mannose, dextrin and glycerol followed sucrose in their favourability for pycnidia production of (PrB) isolate, 524.0, 516.0, 513.3, and 314.7 pycnidia/plate

Table. (12): Effect of Carbon sources on linear growth (mm) of pathogenic isolates of ***B. theobromae*** Pat. and ***F. moniliforme***.

Carbon Sources	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
Starch	25	56	52	88	37	83	15	34
Dextrin	23	57	60	90	37	89	15	32
Glycerol	11	55	16	73	32	90	13	27
Mannose	18	26	63	90	27	90	14	26
Maltose	25	48	56	90	29	88	15	26
Galactose	28	53	53	90	30	88	11	17
Lactose	22	73	50	90	25	74	13	27
Fructose	25	78	59	90	31	86	14	23
Glucose	40	90	70	90	43	90	16	28
Sucrose	40	90	65	90	42	90	14	33
Tukey-HSD 5%>=	0.245	0.271	0.194	0.086	0.286	0.147		

Table (13): Effect of Carbon sources on pycnidial formation and sporulation of pathogenic isolates of ***B. theobromae*** Pat. and ***F. moniliforme***.

Carbon Sources	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F.moniliforme* (MF) spo./ml
d.p.i.	6	9	6	9	6	9	7
Starch	110.0	136.7	72.0	170.7	108.7	138.7	10.40×10^4
Dextrin	230.0	302.7	246.7	406.7	460.0	513.3	10.80×10^4
Glycerol	1.3	57.3	133.3	246.7	114.7	314.7	6.40×10^4
Mannose	62.7	256.0	120.0	346.7	129.3	516.0	5.20×10^4
Maltose	0.0	0.0	56.0	156.0	217.3	256.0	13.20×10^4
Galactose	4.7	4.7	61.3	192.0	38.0	164.7	6.80×10^4
Lactose	50.0	58.3	0.0	85.3	0.0	0.0	3.20×10^4
Fructose	273.3	301.3	150.0	340.0	101.3	268.7	8.80×10^4
Glucose	148.7	180.7	80.0	206.7	254.7	524.0	8.40×10^4
Sucrose	393.3	626.7	180.0	420.0	172.0	598.7	17.55×10^4
Tukey-HSD 5%>=	0.245	0.271	0.194	0.086	0.286	0.147	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.=Days post inoculation

respectivly. The same isolate failed to produce any of pycnidia on the medium containing lactose as a carbon source. The pycnidial production was greatly increased after 6-9 days for all ***B. theobromae*** isolates.

Results in Table (12-13) show that the fungus ***F. moniliforme*** is able to utilize the different carbon sources , the most favourable carbon sources for growth were starch, sucrose, and dextrin. On the other hand, galactose was the least favourable carbon source for the growth of the fungus. The average of spores/ml show that the best carbon sources for sporulation of the fungus were sucrose, maltose, dextrin and starch respectively.

6.1.3 Effect of Nitrogen sources on linear growth and sporulation of *B. theobromae* isolates and *F. moniliforme*

Results presented in Table (14) show that ***B. theobromae*** and ***F. moniliforme*** can use different nitrogen sources for growth , pycnidial production and sporulation. ***B. theobromae*** (MB) isolate recorded its highest growth (90 mm.) after four days incubation when potassium nitrate, sodium nitrate, asparagin, peptone and ammonium chloride were added to Czapek`s medium. While ammonium nitrate, ammonium sulphate and urea yielded poor mycllium growth after two and four days incubation for all ***B. theobromae*** isolates. Sodium nitrate, potassium nitrate, ammonium sulphate, ammonium chloride, asparagin and peptone were the best nitrogen sources for mycellium growth (90 mm) of PB and PrB isolates.

Results shown in Table (15) indicate that asparagin, sodium nitrate, potassium nitrate and peptone were the most favourable nitrogen sources for pycnidial formation of (MB) and PrB isolates. However, potassium and sodium

Table (14): Effect of Nitrogen sources on Linear growth (mm) of pathogenic isolates of ***B. theobromae*** Pat. and ***F.moniliforme***.

Nitrogen Sources	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
Sod. nitrate	80	90	66	90	58	90	17	35
Sod. nitrite	71	90	42	86	56	79	12	31
Potass. nitrate	76	90	65	90	78	90	15	34
Amo. nitrate	54	90	44	75	11	90	12	28
Amo. sulphate	75	83	63	90	66	86	10	20
Amo. chloride	82	90	71	90	64	90	17	32
Urea	10	86	23	45	12	53	11	29
Asparagin	76	90	71	90	65	90	16	35
Peptone	82	90	63	90	81	90	17	32
Without. N.	61	90	57	87	57	90	18	38
Tukey-HSD 5%>=	0.251	0.111	0.295	0.183	0.194	0.146		

Table (15): Effect of Nitrogen sources on pycnidial formation and sporulation of pathogenic isolates of ***B. theobromae*** Pat.and ***F. moniliforme***.

Nitrogen Sources	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF) spo.ml
d.p.i.	6	9	6	9	6	9	7
Sod. nitrate	213.3	253.3	0.0	163.3	366.7	505.3	$27.60x10^4$
Sod. nitrite	209.3	229.0	0.0	0.0	110.7	329.3	$15.60x10^4$
Potass. nitrate	137.3	206.7	0.0	228.0	246.7	480.0	$21.60x10^4$
Amo. nitrate	0.0	134.7	0.0	0.0	0.0	26.7	$10.80x10^4$
Amo. sulphate	0.0	192.0	0.0	166.7	0.0	262.7	$6.00x10^4$
Amo. chloride	356.0	713.3	0.0	225.3	41.3	526.0	$11.20x10^4$
Urea	120.0	166.7	0.0	0.0	0.0	357.3	$26.40x10^4$
Asparagin	166.7	300.0	0.0	0.0	316.0	629.3	$27.20x10^4$
Peptone	153.3	180.0	0.0	0.0	200.0	744.0	$14.00x10^4$
Without. N.	49.3	118.0	0.0	0.0	0.0	0,0	$8.00x10^4$
Tukey-HSD 5%>=	33.76	59.43	ns	31.55	35.30	82.99	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.=Days post inoculati

nitrate were only favourable nitrogen sources for pycnidial production of (PB) isolate, 228.0 and 163.3 pycnidia/plate respectivly. All ***B. theobromae*** isolates succeded to produce pycnidia on Czapek`s medium contained ammonium chloride but they were small and sterile. It was remarked that PB isolate failed to produce pycnidia on sodium, ammonium nitrate, urea, asparagin and peptone when used as a nitrogen sources. Results shown in Table (14) also indicate that ***F. moniliforme*** produced its highest growth after 2 days incubation at sodium nitrate, ammonium chloride peptone, asparagin and potassium nitate respectively. Although the highest average of linear growth of the fungus was recorded in the medium without any nitrogen source, the fungal growth was poor dispersed mycelium and low sporulation at the two incubation periods.

Sporulation of ***F.moniliforme*** reached its highest degrees on media which contain sodium nitrate, asparagin, urea, and potassium nitrate respectively as shown in Table (15). Ammonium sulphate was the lowest favourable nitrogen source for growth and sporulation of the fungus.

6.2 Physical factors

6.2.1 Effect of different Temperature on linear growth and sporulation of *B. theobromae* isolates and *F. moniliforme.*

Results in Table (16) show that ***B. theobromae*** isolates can grow at 7 to 35°C. No growth was recorded at 4°C for all isolates, but it was clearly from results that the best temperature for growth of all ***B. theobromae*** isolates between 25 to 35°C . The highest averages of linear growth were obtained at 25, 30 and 35 °C. respectively.

Table (16): Effect of different Temperature on linear growth (mm) of pathogenic isolates of *B. theobromae* Pat. and *F. moniliforme*.

Temperature degrees	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
35°C	53	83	69	90	72	88	12	18
30°C	42	88	65	90	65	90	20	40
25°C	80	90	66	90	58	90	17	25
20°C	28	69	34	75	38	82	15	35
15°C	25	47	31	56	26	47	14	33
10°C	16	23	19	28	12	22	6	15
7°C	6	8	14	21	12	21	6	11
4°C	6	6	6	7	6	6	6	6
Tukey-HSD 5%>=	10.80	16.93	10.91	13.48	14.75	14.75		

Table (17): Effect of different temperature on pycnidial formation and sporulation of pathogenic isolates of *B. theobromae* Pat. and *F. moniliforme*.

Temperature	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF) spo./ml
d.p.i.	6	9	6	9	6	9	7
35°C	246.7	293.3	103.3	176.7	146.7	164.0	$8.80x10^4$
30°C	333.3	420.0	183.3	273.3	246.7	326.7	$10.00x10^4$
25°C	206.7	253.3	160.0	232.0	353.3	378.0	$27.60x10^4$
20°C	0.0	97.0	22.7	129.3	8.0	101.3	$8.00x10^4$
15°C	0.0	29.0	0.0	68.0	0.0	6.7	$6.80x10^4$
10°C	0.0	0.0	0.0	0.0	0.0	0.0	$3.20x10^4$
7°C	0.0	0.0	0.0	0.0	0.0	0.0	$3.20x10^4$
4°C	0.0	0.0	0.0	0.0	0.0	0.0	$3.20x10^4$
Tukey-HSD 5%>=	11.18	17.89	11.55	14.01	21.24	26.06	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.= Days post inoculation

Data in Table (17) show that is no sporulation or pycnidia were detected at 4, 7 and 10°C for all *B. theobromae* isolates but indicate that the optimal temprature for pycnidial formation of (MB and PB) isolates is 30°C where the average number of pycnidia, 420.0 and 273.3 pycnidia/plate respectively after 9 days incubation. The optimal degree of temprature for sporulation and pycnidial formation of (PrB) isolate is 25°C where the average pycnidial number was 378.0 pycnidia/culture plate. The minimal temprature for sporulation and pycnidial formation of all *B. theobromae* isolates is 15°C. The average number of pycnidia was significantly increased at the different degrees of temperature for each isolate and with the increasing of incubation period from 6 to 9 days.

Data shown in Table (16-17) indicate that 30°C was the best favourable temperature for growth of *F. moniliforme*. but this temperature degree was un-favourable for the sporulation of the fungus as at 25°C. after two and four days incubation while the sporulation reached its highest degree after 7 days as shown in the tabulated results. The lowest growth and sporulation of the fungus was obtained at 7°C. degree after 4 days incubation.

6.2.2 Effect of Relative humidity on linear growth and sporulation of *B. theobromae* isolates and *F. moniliforme.*

Results shown in Table (18) indicate that *B. theobromae* can grow at RH values ranging from 14 to 100%. However, the average linear growth has gradually increased by increasing RH values from 14 to 90% for (MB and PrB) isolates and 14 to 100% for (PB) isolate at two and four days incubation. From 80 to 100% RH the average linear growth reached its maximum growth after 4

Table (18): Effect of different of Relative humidity on Linear growth of the pathogenic isolates of *B.theobromae* Pat and *F. moniliforme*.

Relative humidity	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F.moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
100%	28	70	31	88	30	76	12	23
90%	32	84	17	84	29	87	12	26
85%	32	83	30	89	30	90	13	27
80%	33	84	36	86	25	90	12	29
74%	15	64	21	78	15	71	12	32
50%	20	64	24	71	16	56	11	28
14%	16	63	24	54	20	65	12	32
Tukey-HSD 5%>=	0.373	0.688	0.317	0.531	0.224	0.451		

Table (19): Effect of Relative humidity on pycnidial formation and sporulation of pathogenic isolates of *B. theobromae* Pat.. and *F. moniliforme*.

Relative humidity	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F.moniliforme* (MF)
d.p.i.	6	9	6	9	6	9	7
100%	80.0	169.3	0.0	71.3	0.0	200.0	$1.90x10^4$
90%	0.0	0.0	0.0	18.7	0.0	0.0	$4.375x10^4$
85%	13.3	120.0	0.0	0.0	0.0	0.0	$3.025x10^4$
80%	0.0	0.0	0.0	0.0	0.0	0.0	$1.85x10^4$
74%	0.0	0.0	0.0	60.0	0.0	0.0	$1.125x10^4$
50%	0.0	0.0	0.0	64.0	0.0	0.0	$2.50x10^4$
14%	0.0	0.0	0.0	39.3	0.0	0.0	$2.175x10^4$
Tukey-HSD 5%>=	8.17	59.54	ns	19.64	ns	23.30	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.=Days post inoculation

days incubation. While at 14% RH were the average linear growth for (MB, PB and PrB) isolates, 63, 54 and 65 mm respectively. The average linear growth was significantly increased by increasing incubation period from 2 to 4 days and with the different degrees of relative humidity for ***B. theobromae*** isolates.

Data in Table (19) show that pycnidial formation of ***B. theobromae*** isolates at the different RH values was greatly affected. It was clear that the optimal RH value for sporulation and pycnidial formation of all ***B. theobromae*** isolates is 100% where the average of pycnidial number were 169.3 , 71.3 and 200.0 pycnidia/plate after 9 days incubation. However , it is possible to say that most RH values were un-favourable for production of vital pycnidia of all ***B. theobromae*** isolates inspite of (PB) isolate suceeded to produce large number of pycnidia at different RH values ranging from 14 to 100%. Production of pycnidia was generally affected by the incubation period where the average of pycnidial number were increased significantly by prolonging the incubation period from 6 to 9 days.

Data presented in Table (19) show that ***F. moniliforme*** isolated from decayed mango fruits was not greatly affected by the variability in the RH values where the fungus could be grow at different RH values, but the average number of spores/ml indicate that the best RH values for sporulation of the fungus lay between 85-90% RH.

6.3.3 Effect of pH on linear growth and sporulation of *B. theobromae* isolates and *F. moniliforme.*

Data in Table (20) show that the optimum pH for linear growth of ***B. theobromae*** isolates is pH 5. after two and four days incubation. The lowest

average of linear growth were obtained at pH 3 and 8 after two and four days incubation for all ***B. theobromae*** isolates. It was clearly from the results that ***B. theobromae*** isolates could grow at different pH values ranging from 3 to 8.

Data in Table (21) illustrate that the best pH values for sporulation and pycnidial formation of (MB) isolate being between 5 to 6 where the pycnidial number were 166.6 and 144.7 pycnidia /plate after 9 days incubation with significant defferances whereas, the best pH values for the pycnidial formation of (PB and PrB) isolates being between 6 to 7 where the average number of pycnidia were 107.7 and 82.0 pycnidia/plate for PB isolate and 194.3 and 223.3 for PrB isolate after 9 days incubation with significant differerances. All of ***B. theobromae*** isolates yielded the lowest number of pycnidia at pH 3.

Data in Table (21) show that ***F. moniliforme*** can grow at the different pH values between 3-8 and the optimal growth for the fungus was obtianed at pH 3 and 4 respectivly. While the best value for sporulation of the fungus is pH 6.

6.3 Effect of Light colour (Waves) on linear growth and sporulation of *B. theobromae* isolates and *F. moniliforme.*

Data in Table (22) show the effect of different light colours on growth of ***B. theobromae*** isolates at 2 and 4 days incubation. It was clear that there is a significant differences between the different light colours on growth of ***B. theobromae*** isolates at two and four days incubation.

Results shown in Table (23) indicate that there is no significant effect of the different light colours on sporulation and pycnidial formation of MB isolate at 6 and 9 days incubation. It is clear also from the results that the white, blue and yellow colours

Table (20): Effect of pH on linear growth of pathogenic isolates of ***B. theobromae*** Pat. and ***F. moniliforme*** isolates

pH	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
8	13	25	24	44	23	50	13	29
7	35	70	44	88	51	88	12	27
6	34	64	50	89	51	88	12	22
5	49	84	52	90	57	88	11	19
4	35	82	40	71	41	90	10	63
3	14	58	19	32	16	27	10	68
Tukey-HSD 5%>=	0.339	0.483	0.157	0.267	0.159	0.195		

Table (21): Effect of pH on pycnidial formation and sporulation of pathogenic isolates of ***B. theobromae*** Pat and ***F. moniliforme***.

pH	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF) spo /ml
d.p.i.	6	9	6	9	6	9	7
8	14.0	19.3	4.3	63.3	5.0	149.3	5.60x104
7	72.0	117.3	13.7	82.0	23.7	223.3	11.20x104
6	101.3	144.7	35.0	107.7	35.7	194.3	31.20x104
5	97.3	166.6	11.7	58.0	5.7	157.3	18.40x104
4	47.3	80.0	8.7	53.3	2.3	58.3	7.20x104
3	5.3	11.3	0.0	18.3	0.0	40.0	7.20x104
Tukey-HSD 5%>=	13.99	19.13	3.21	13.0	6.09	30.81	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.= Days post inoculation

Table (22): Effect of different light colours on Linear growth pathogenic isolates of ***B. theobromae*** Pat.and ***F. moniliforme***.

Light colour	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)	
d.p.i.	2	4	2	4	2	4	2	4
White	26	78	65	90	48	90	20	31
Red	25	68	62	90	43	90	18	32
Blue	27	58	69	90	42	90	20	36
Yellow	35	77	63	90	47	90	18	36
Green	33	75	62	90	47	90	20	38
Black	27	72	70	90	42	90	17	35
*Tukey-HSD 5% >=	0.342	0.601	0.266	ns	0.324	ns		

Table (23): Effect of Light colours on pycnidial formation and sporulation of pathogenic isolates of ***B. theobromae*** Pat. and ***F. moniliforme***.

Light colour	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F.moniliforme* (MF) spo./ml
d.p.i.	6	9	6	9	6	9	7
White	206.7	276.7	233.3	413.3	76.0	260.0	$6.80x10^4$
Red	142.7	232.7	54.0	181.3	126.7	273.3	$13.20x10^4$
Blue	190.7	184.0	184.0	391.3	19.3	180.0	$14.40x10^4$
Yellow	146.7	164.0	267.3	374.0	0.0	164.0	$13.60x10^4$
Green	160.0	206.7	64.0	190.7	74.0	180.0	$8.00x10^4$
Black	135.3	158.7	34.0	57.0	0.0	10.7	$12.40x10^4$
*Tukey-HSD 5% >=	71.25	68.92	54.94	58.24	23.85	34.45	

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF=Mango isolate
*d.p.i= Days post inoculation

has significant effect on pycnidial formation of PB isolate where the average of pycnidial number were 413.3 , 391.3 and 374.0 pycnidia/culture plate after 9 days incubation whereas, only red and white colours has significant effect on pycnidial formation of PrB isolate where the average of pycnidial number were 273.3 and 260.0 pycnidia/culture plate after 9 days incubation.

Data in Table (22-23) show no significant effect of the test light colours on growth of *F. moniliforme* at two days incubation but green, yellow and blue light colours were better than the other light colours for growth at 4 days whereas blue, yellow and red colours had clear effect on sporulation of the fungus.

7.Chemical changes due to infection at different growth stages of mango fruits

7.1 Changes in Titrable acidity, pH, TSS of cv. Pyri

Data in Table (24) show that the infection at rapid growth stage decreased the acidity of all wounded inoculated fruits with *B. theobromae* isolates and *F. moniliforme* where the acidity values were 0.4 , 1.0 and 1.3 mg/g fresh weight by MB, PB and PrB isolates and MF respectively, in the same time was the infection 100% after 5 days incubation. On the other hand no evident on decreasing the acidity in un-wounded fruits and controls. As well as the TSS percentage was decreased also on wounded inoculated fruits with *B. theobromae* isolates where TSS were 4.8% by MB isolate, in the same time was the infection 100% . Whereas no clear decreasing of TSS percentage on un-wounded fruits comparatively with controls. The pH values of all treatments ranged between 4 to 5.5.

Table (24): Changes in titrable acidity, pH and TSS, in mango fruits (cv. Pyri) at different fruit growth stages.

Treatments		Rapid growth stage 50 d.f.s.				Pre- ripening stage 80 d.f.s.				Ripening stage 110 d.f.s.				Mature ripening stage 130 d.f.s.			
		pH	TSS %	Acidity mg/gm	% disease	pH	TSS %	Acidity mg/gm	% disease	pH	TSS %	Acidity mg/gm	% disease	pH	TSS %	Acidity mg/gm	% disease
MB	**w.**	5.5	4.8	0.4	100.0	3.5	8.0	3.1	100.0	4.0	10.0	1.3	100.0	4.5	13.4	0.3	90.0
MB	**un-w.**	4.0	9.0	2.2	0.0	3.5	8.4	3.8	22.5	4.0	12.0	1.9	15.0	5.0	14.6	0.4	35.0
PB	**w.**	4.0	7.6	1.0	100.0	3.5	8.4	2.8	100.0	4.0	9.2	1.4	75.0	4.5	11.6	0.5	72.5
PB	**un-w.**	4.5	10.2	2.1	0.0	3.5	7.8	3.1	40.0	4.0	13.0	1.7	0.0	5.0	16.2	0.6	0.0
PrB	**w.**	4.0	8.4	2.6	100.0	3.5	8.8	3.7	100.0	4.0	10.6	1.1	70.0	4.5	16.2	0.5	72.5
PrB	**un-w.**	4.0	9.4	2.2	3.3	3.5	9.4	4.0	15.0	4.0	12.0	1.5	10.0	5.0	15.4	0.6	25.0
MF	**w.**	4.0	9.0	1.3	18.3	3.5	9.2	4.7	22.5	4.0	12.6	0.8	25.0	4.5	12.2	0.6	15.0
MF	**un-w**	4.5	9.0	1.9	0.0	3.5	7.8	3.1	0.0	4.0	12.0	1.3	0.0	5.0	13.4	0.9	15.0
Con.	**w.**	5.5	11.2	1.6	0.0	3.5	9.2	5.2	0.0	4.0	12.6	1.5	0.0	5.0	12.0	0.5	10.0
Con.	**un-w**	4.0	10.4	2.2	0.0	3.5	9.6	4.2	0.0	4.0	13.0	1.6	0.0	5.0	17.6	0.5	20.0

*MB=*B. theobromae* (mango isolate)
*PB=*B. theobromae* (peach isolate)
*PrB=*B. theobromae* (pear isolate)
*MF=*F. moniliforme* (mango isolate)
*W=wounded fruits
*Un-w=un-wounded fruits
*d.f.s.=days from fruit set.

At pre-ripening stage it seems that slight clear effect of the infection on decreasing TSS percentages at inoculated wounded and un-wounded fruits with ***B. theobromae*** isolates although the infection was 100% by ***B. theobromae*** isolates. While a slight decreasing of acidity quantity was recorded at wounded and un-wounded fruits inoculated with ***B. theobromae*** compared with controls as shown in the Table (24) . At the same time the pH values were 3.5 of all treatments.

A slight decrease in the percentage of TSS and acidity quantity was recorded at ripening stage in relation to the infection with isolates of ***B. theobromae*** and ***F. moniliforme*** only on wounded fruits compared with control but no decrease was recorded on un-wounded ones compared with control. At the same time the pH values were 4 in this growth stage of all treatments.

The percentges of TSS were raised as a natural evidence of ripening stage. It also clear that no clear effect of infection on decreasing it or on the changes the acidity of inoculated wounded and un-wounded fruits. In this stage the pH values ranged from 4.5 to 5.

7.1.2 Changes in Titrable acidity, pH and TSS of cv. Taimour

Results presented in Table (25) indicate that the infection at the rapid growth stage has decreased the acidity of all wounded inoculated fruits with the isolates of ***B. theobromae*** and ***F. moniliforme***. On the other hand, no evidence on decreasing the acidity on un-wounded fruits and controls ones. As well as, no clear evidence on decreasing TSS in relation to infection on wounded and un-wounded inoculated fruits. In this stage the pH values ranged between 4.5-5.

Table (25): Changes in titrable acidity, pH and TSS in mango fruits (cv. Taimour) at different fruit growth stages.

Treatments		Rapid growth stage 50 d.f.s.				Pre-ripening stage 80 d.f.s.				Ripening stage 110 d.f.s.				Mature ripening stage 130 d.f.s.			
		pH	TSS %	Acidity mg/gm	% disease	PH	TSS %	Acidity mg/gm	% disease	pH	TSS %	Acidity mg/gm	% disease	pH	TSS %	Acidity mg/gm	% disease
MB	**w.**	4,5	6,8	1,9	100,0	3,5	10,0	1,9	100,0	4,0	12,2	0,9	100,0	5,5	10,6	0,5	95,0
MB	**un-w.**	4,0	8,4	3,1	0,0	3,5	9,8	3,1	0,0	4,0	14,0	0,8	17,5	4,5	12,4	1,0	35,0
PB	**w.**	4,0	7,4	1,5	93,3	3,5	9,4	1,5	97,5	4,0	11,0	0,9	85,0	4,5	10,0	0,7	82,5
PB	**un-w.**	4,0	8,4	4,8	0,0	3,5	9,2	4,8	20,0	4,5	15,6	0,9	0,0	4,5	12,2	0,7	45,0
PrB	**w.**	4,0	6,6	1,7	96,7	3,5	8,8	1,7	100,0	4,0	12,2	1,5	92,5	4,5	11,4	0,9	75,0
PrB	**un-w.**	4,5	8,8	5,8	0,0	3,5	8,8	5,8	20,0	4,5	14,8	1,6	0,0	5,5	14,4	0,5	7,5
MF	**w.**	4,5	8,8	1,5	13,3	3,5	8,4	1,5	20,0	4,0	15,6	1,5	25,0	5,0	13,8	0,7	25,0
MF	**un-w.**	4,5	11,8	4,2	0,0	3,5	9,6	4,2	0,0	4,5	15,6	1,3	0,0	5,0	14,6	0,6	21,5
Con.	**w.**	5,0	7,4	2,4	0,0	3,5	9,6	2,4	0,0	4,5	15,6	1,5	0,0	5,5	15,0	0,6	5,0
Con.	**un-w.**	4,5	11,2	3,5	0,0	3,5	10,0	3,5	0,0	4,5	15,6	1,0	0,0	5,5	17,0	0,6	17,5

*MB=*B. theobromae* (mango isolate)
*PB=*B. theobromae* (peach isolate)
*PrB=*B. theobromae* (pear isolate)
*MF=*F. moniliforme* (mango isolate)
*W=Wounded fruits
*Un-W.= Un-wounded fruits
*d.a.s=days after fruit se

At the pre-ripening stage, similar results were obtained to indicate that the infection in this stage decreased the acidity of all inoculated wounded fruits with ***B. theobromae*** and ***F. moniliforme*** while no evidence on decreasing the acidity on un-wounded fruits as compared with controls. On the other hand, infection has no effect on decreasing TSS in wounded and un-wounded fruits comparatively to control. In this stage was pH value 3.5 of all treatments. At the ripening stage decreased the infection TSS (total solouble solids) percentages on wounded inoculated fruits with ***B. theobromae*** isolates while it has no effect on the acidity quantity in this stage on all of wounded and un-wounded fruits compared with controls. The pH values in this stage ranged between 4-4.5.

The infection at mature ripening stage decreased percentage of TSS on wounded inoculated fruits with ***B. theobromae*** isolates while it has also no effect on the quantity of the acidity in this stage on all wounded and un-wounded fruits where the acidity decreased as a natural evidince of ripening compared with controls. In this growth stage the pH values ranged between 4.5-5.5.

7.2 The relationship between the fungal infection and the chemical composition of mango fruit cvs.

7.2.1 In Pyri cv.

7.2.1.1 In rapid growth stage

Results presented in Table (26) and Fig. (7) show that there was a reduction of total sugars at all of wounded inoculated fruits with ***B. theobromae*** isolates. The highest reduction was recorded by MB isolate where the sugar content in the flesh and peel of the ifruits were 24.09 and 60.24 µg/g fresh weight.

Table (26): The relationship between the fungal infection and the chemical composition of Pyri mango fruit cv. at the rapid growth stage (50 days from fruit set).

Wounded fruits		Sugars µg/g			Phenols µg/g			Amino acids	Disease %
		Total	Reduc.	Un-red.	Total	Free	Conj.	µg/g	
MB	Flesh+Peel	42.17	12.05	30.12	2.22	1.23	0.99	0.93	100,0
PB	Flesh+Peel	60.24	60.24	0.0	3.58	2.22	1.36	0.93	100,0
PrB	Flesh+Peel	96.39	84.34	12.05	7.16	3.95	3.21	0.78	100,0
MF	Flesh+Peel	210.84	204.82	6.02	16.05	11.36	4.69	2.92	18,3
Con.	Flesh+Peel	325.30	253.01	72.29	12.96	7.04	5.92	4.16	0,0
MB	Flesh	24.09	12.05	12.04	1.73	0.99	0.74	1.06	100,0
PB	Flesh	42.17	36.14	6.03	3.09	1.48	1.61	0.99	100,0
PrB	Flesh	30.12	24.10	6.02	2.22	1.23	0.99	0.99	100,0
MF	Flesh	192.77	150.60	42.17	3.09	1.48	1.61	1.37	18,3
Con.	Flesh	168.67	120.48	48.19	1.85	0.49	1.36	2.24	0,0
MB	Peel	60.24	42.17	18.07	4,69	3.21	1.48	0.68	100.0
PB	Peel	132.53	114.45	18.08	11.60	6.66	4.94	0.87	100.0
PrB	Peel	210.84	156.62	24.22	16.05	9.88	6.17	0.47	100.0
MF	Peel	253.01	253.01	0.0	21.60	14.81	6.79	1.55	18.3
Con.	Peel	433.73	373.49	60.24	21.60	17.28	4.32	4.53	0.0
Un-wounded fruits									
MB	Flesh+Peel	277.11	240.96	36.15	15.43	7.16	8.27	5.78	0.0
PB	Flesh+Peel	289.16	277.11	12.05	13.58	9.38	4.20	3.76	0.0
PrB	Flesh+Peel	168.67	168.67	0.0	9.87	5.18	4.69	2.67	3.3
MF	Flesh+Peel	253.01	180.72	72.29	14.19	7.41	6.78	4.42	0.0
Con.	Flesh+Peel	132.53	132.53	0.0	6.42	2.71	3.11	4.35	0.0
MB	Flesh	216.87	156.62	60.25	2.47	0.62	1.89	3.91	0.0
PB	Flesh	216.87	180.72	26.15	3.95	1.36	2.59	4.16	0.0
Pr	Flesh	216.87	168.68	48.19	2.47	1.23	1.24	2,48	3.3
MF	Flesh	144.58	120.48	24.10	3.58	1.36	2.22	3.91	0.0
Con.	Flesh	120.48	84.34	36.14	1.60	0.86	0.14	3.35	0.0
M B	Peel	325.30	289.16	36.14	16.66	14.19	2.47	3.42	0.0
PB	Peel	433.73	421.69	12.04	14.81	11.11	3.70	3.14	0.0
PrB	Peel	385.54	337.35	48.19	17.28	16.05	1.23	1.52	3.3
MF	Peel	289.18	253.01	36.15	18.52	16.05	2.47	3.38	0.0
Con.	Peel	240.96	216.87	24.09	12.96	10.86	2.10	3.54	0.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

As well as, the infection reduced also the total phenols in each of flesh and peel of fruits inoculated with ***B. theobromae*** isolates compared with control ones. The amino acids content was reduced in all of decayed fruits with ***B. theobromae*** and ***F. moniliforme*** isolates while the highest content recorded in the healthy ones.

No evidence on reduction of chemical compositions (sugars, phenols and amino acids) was recorded in un-wounded inoculated fruits with ***B. theobromae*** and ***F. moniliforme*** compared with controls ones. It is also clear that, no infection of all treatments but the quantity of phenols was raised in the peel of fruits to reach 17.28 µg/g fresh weight by ***B. theobromae*** PrB while the content in control was 12.96 µg/g fresh weight.

7.2.1.2 In pre-ripening stage

Data presented in Table (27) and Fig. (7) show also that there was a reduction of the total sugar content of all treated wounded fruits with ***B. theobromae*** isolates in each of fruit's flesh and peel. The highest reduction in sugars was recorded by infection with MB and PB isolates as shown in the Table (27) where was recorded also high reduction in total phenol content in the peel of wounded fruits inoculated with ***B. theobromae*** isolates compared with control ones while a little difference was recorded between the quantity of amino acids in rotted and control fruits.

In un-wounded inoculated fruits with ***B. theobromae*** and ***F. moniliformae*** isolates no differences between sugar quantities in all of un-wounded and control fruits but the quantity of total phenol was raised in the peel of treated un-wounded fruits with ***B. theobromae*** 18.51 µg/g fresh weight by PrB isolate while the content of

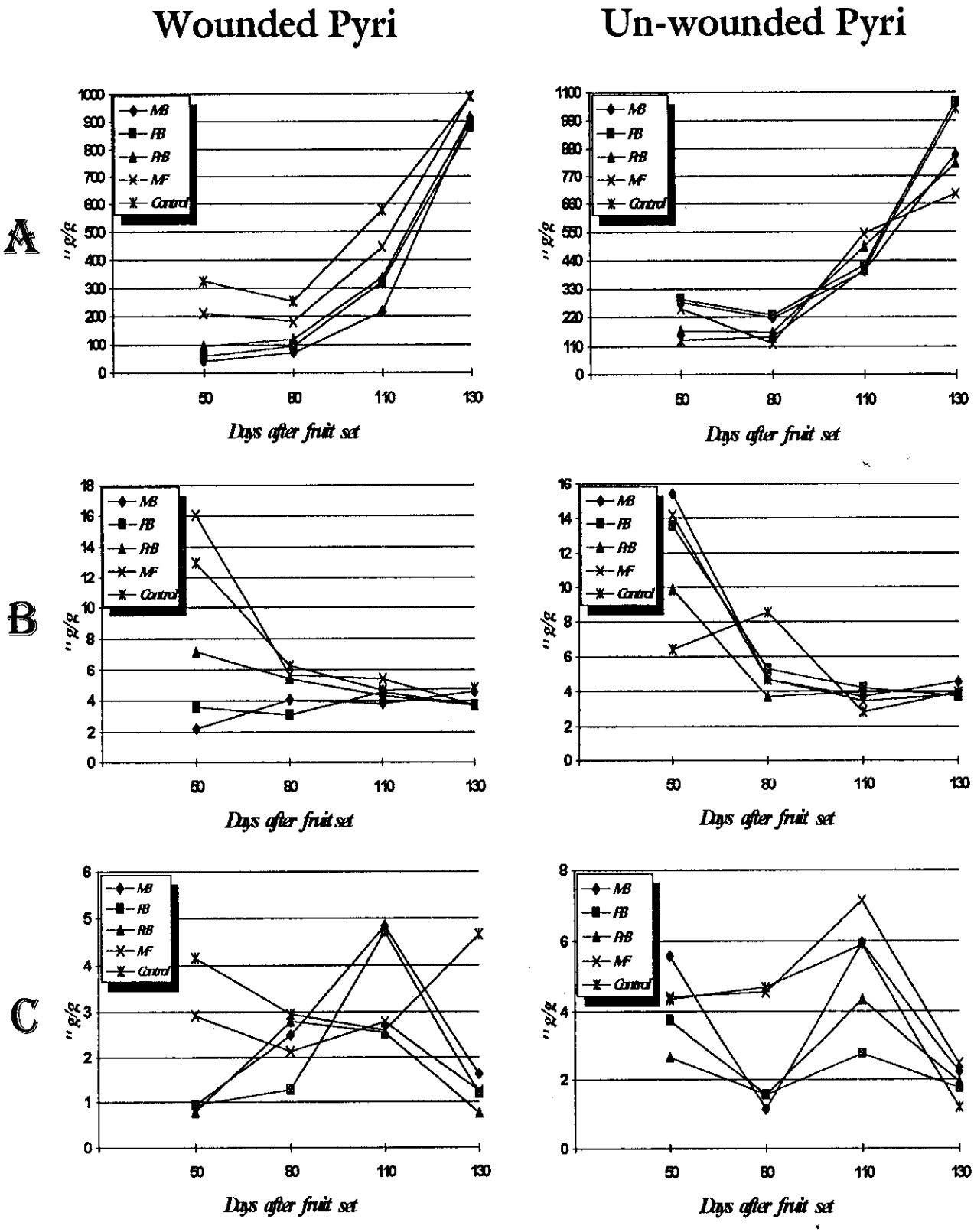

Fig. (7): Chemical changes in wounded and un-wounded mango fruits cv. Pyri at different growth stages (Flesh and Peel).
(A) Total sugars. (B) Total phenols. (C) Total amino acids.

Table (27): The relationship between the fungal infection and the chemical composition of Pyri mango fruit cv. at the pre-ripening growth stage (80 days from fruit set).

Wounded fruits	Sugars µg/g			Phenols µg/g			Amino acids	Disease %
	Total	Reduc.	Un-red.	Total	Free	Conj.	µg/g	
MB Flesh+Peel	72.29	48.19	24.10	4.07	1.97	2.10	2.05	100.0
PB Flesh+Peel	96.38	36.14	60.24	3.09	1.85	1.24	1.27	100.0
PrB Flesh+Peel	120.48	72.29	48.19	5.43	2.22	3.21	2.08	100.0
MF Flesh+Peel	180.72	102.41	78.31	5.68	2.47	3.21	2.14	22.5
Con. Flesh+Peel	253.01	132.53	120.48	6.29	2.47	3.82	2.95	0.0
MB Flesh	72.29	24.10	48.19	2.34	0.86	1.48	1.74	100.0
PB Flesh	72.29	12.05	60.24	1.36	0.86	0.50	1.68	100.0
PrB Flesh	96.39	36.14	60.25	2.59	0.99	1.60	1.74	100.0
MB Flesh	144.58	90.36	54.22	3.95	0.85	3.09	2.05	22.5
Co n. Flesh	180.72	132.53	48.14	1.73	0.62	1.11	3.70	0.0
MB Peel	144,58	96.39	48.19	9.87	4.20	5.67	1.24	100.0
PB Peel	120.48	48.19	72.29	6.79	4.07	2.70	0.84	100.0
PrB Peel	156.62	120.48	36.14	8.02	4.32	3.70	0.84	100.0
MF Peel	228.91	108.43	120.48	15.43	7.90	7.53	1.24	22,5
Con. Peel	373.49	301.20	72.29	16.05	11.36	4.69	2.58	0.0
Un-wounded fruits								
MB Flesh+Peel	216.87	162.65	54.22	4.69	2.22	2.47	1.13	22.5
PB Flesh+Peel	228.91	132.53	96.38	5.31	1.97	3.34	1.55	40.0
PrB Flesh+Peel	162.65	120.48	42.17	3.70	0.99	2.71	1.55	15.0
MF Flesh+Peel	120.48	78.31	42.17	4.69	1.60	3.09	4.55	0.0
Con. Flesh+Peel	144.58	90.36	54.22	8.52	6.29	2.23	4.69	0.0
MB Flesh	196.38	144.58	51.80	1.97	0.62	1.35	1.45	22.5
PB Flesh	204.82	144.58	60.24	2.10	1.11	0.99	2.05	40.0
PrB Flesh	192.71	144.58	48.19	2.34	0.86	1.48	2.64	15.0
MF Flesh	132.53	42.17	90.36	0.99	0.49	0.50	2.58	0.0
Con. Flesh	132.53	72.29	60.24	1.72	0.49	1.23	2.70	0.0
MB Peel	242.17	196.02	46.15	16.66	7.25	9.41	1.82	22.5
PB Peel	313.25	204.82	108.43	16,66	7.04	9.62	1.34	40.0
PrB Peel	265.06	253.01	12.05	18.51	9.50	9.01	1.96	15.0
MF Peel	228.91	210.84	18.07	14.81	7.90	6.91	1.74	0.0
Con. Peel	289.15	228.91	60.24	12.22	5.86	6.36	2.39	0.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

control was 12.22 µg/g fresh weight. In this growth stage, infection reduced the content of total amino acids in the flesh and peel of un-wounded fruits.

7.2.1.3 In ripening stage

Results presented in Table (28) and illustrated by Fig. (7) show also that there was a reduction of the total sugar content of all treated wounded mango fruits with ***B. theobromae*** isolates in each of fruit's flesh and peel. The highest reduction in sugars was recorded by infection with MB and PB isolates as shown in Table(28). Similar reduction was also recorded in total phenol content by the same isolates of ***B. theobromae*** while no clear effect on the content of amino acids.

No clear differences between amino acids, sugars and phenols quantities in un-wounded fruits inoculated with isolates of ***B. theobromae*** and ***F. moniliforme*** and controls ones.

7.2.1.4 In mature ripening stage

Results presented in Table (29) and Fig. (7) indicate that there was no clear reduction of the total sugars, phenols and amino acids contents of all wounded an un-wounded mango fruits inoculated with ***B. theobromae*** isolates in each of fruit's flesh and peel compared with controls. Data in Table (29) also show that the infection increased the quantities of reduced sugars of all wounded flesh inoculated with ***B. theobromae*** isolates compared with control ones.

Table (28): The relationship between the fungal infection and the chemical composition of Pyri mango fruit cv. at ripening growth stage (110 days from fruit set)

Wounded fruits	Sugars µg/g			Phenols µg/g			Amino acids µg/g	Disease %
	Total	Reduc.	Un-red.	Total	Free	Conj.		
MB Flesh+Peel	216.87	192.77	24.10	3.82	1.48	2.34	4.84	100.0
PB Flesh+Peel	321.68	285.54	36.14	4.54	3.21	3.33	4.72	75.0
PrB Flesh+Peel	337.35	277.11	60.24	4.32	1.97	2.35	2.55	70.0
MF Flesh+Peel	445.78	349.40	96.38	5.43	1.97	3.46	2.79	25.0
Con. Flesh+Peel	578.31	469.88	108.43	4.69	2.71	1.98	2.61	0.0
MB Flesh	198.79	168.67	30.12	3.45	1.85	1.60	2.98	100.0
PB Flesh	397.59	277.10	120.49	2.59	0.86	1.73	5.47	75.0
PrB Flesh	397.59	397.57	0.0	3.33	1.48	1.85	2.24	70.0
MF Flesh	746.99	530.12	216.87	3.82	1.23	2.59	7.76	25.0
Con. Flesh	662.65	168.68	493.97	2.71	0.62	2.09	1.93	0.0
MB Peel	265.06	216.87	48.19	7.53	2.84	4.69	2.69	100.0
PB Peel	271.08	253.01	18.07	10.12	6.17	3.95	2.17	75.0
PrB Peel	253.01	228.91	24.10	4.20	1.60	2.60	0.87	70.0
MF Peel	471.08	362.65	108.43	9.50	5.92	3.58	2.11	25.0
Con. Peel	397.59	337.35	60.24	10.99	6.05	4.96	1.62	0.0
Un-wounded fruits								
MB Flesh+Peel	397.59	397.59	0.0	3.70	2.10	1.60	5.96	15.0
PB Flesh+Peel	421.69	301.20	120.49	4.02	1.72	2.35	2.79	0.0
PrB Flesh+Peel	493.97	469.88	24.09	3.95	1.48	2.42	4.35	10.0
MF Flesh+Peel	543.37	674.70	178.67	3.45	1.60	1.85	7.14	0.0
Con. Flesh+Peel	403.61	325.30	78.31	2.84	1.11	1.73	5.09	0.0
MB Flesh	518.07	433.73	84.34	2.96	1.48	2.34	9.32	15.0
PB Flesh	373.49	277.11	96.38	2.22	0.74	1.48	4.84	0.0
PrB Flesh	481.92	409.63	72.29	3.33	1.11	2.22	8.69	10.0
MF Flesh	566.28	277.10	289.16	2.84	0.61	2.23	9.32	0.0
Con. Flesh	481.92	301.20	180.72	2.34	0.74	1.60	4.16	0.0
MB Peel	337.35	325.30	12.05	6,54	2.96	3,58	3.29	15.0
PB Peel	373.49	325.30	48.19	14.19	6.79	7,40	1.43	0.0
PrB Peel	481.92	433.73	48.19	11.36	7.04	4,32	2.42	10.0
MF Peel	403.61	397.59	6.02	9.01	7.04	1,97	3.85	0.0
Con. Peel	421.69	385.54	36.15	12.96	7.65	5,31	1.93	0.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

Table (29): The relationship between the fungal infection and the chemical composition of Pyri mango fruit cv. at mature ripening stage (130 days from fruit set) .

Wounded fruits	Sugars µg/g			Phenols µg/g			Amino acids µg/g	Disease %
	Total	Reduc.	Un-red.	Total	Free	Conj.		
MB Flesh+Peel	912.1	638.6	273.5	4.57	2.83	1.74	1.62	90.0
PB Flesh+Peel	879.5	686.8	192.8	3.70	1.23	2.47	1.18	72.5
PrB Flesh+Peel	915.7	783.1	132.5	3.70	1.73	1.97	0.75	72.5
MF Flesh+Peel	990.4	882.0	108.4	3.70	1.60	2.10	1.24	15.0
Con. Flesh+Peel	987.9	867.5	120.5	4.81	4.20	0.61	4.66	10.0
MB Flesh	819.3	433.7	385.6	3.58	1.36	2.22	2.48	90.0
PB Flesh	855.4	481.9	373.5	4.07	0.74	3.33	4.53	72.5
PrB Flesh	1108.4	951.8	156.6	4.32	1.85	2.47	4.66	72.5
MF Flesh	530.1	271.1	253.0	3.21	1.11	2.10	0.68	15.0
Con. Flesh	1132.5	265.1	867.5	3.83	0.99	2.84	1.18	10.0
MB Peel	746.9	674.7	72.3	12.34	9.88	2.46	0.87	90.0
PB Peel	794.2	590.4	204.8	4.20	2.59	1.61	1.18	72.5
PrB Peel	771.1	771.1	0,0	12.96	8.89	4.07	1.55	72.5
MF Peel	554.2	518.1	36.1	17.90	12.10	5.80	0.75	15.0
Con. Peel	722.9	722.9	0.0	8.39	8.02	0.37	1.12	10.0
Un-wounded fruits								
MB Flesh+Peel	855.4	698.8	156.6	4.57	1.48	3.09	2.24	35.0
PB Flesh+Peel	1060.2	819.3	240.9	3.70	3.21	0.49	1.74	0.0
PrB Flesh+Peel	819.3	626.5	192.8	3.95	1.85	2.10	1.93	25.0
MF Flesh+Peel	698.8	385.5	313.3	3.08	1.48	1.60	2.05	15.0
Con. Flesh+Peel	1036.1	554.2	481.9	3.95	1.11	2.84	1.18	20.0
MB Flesh	915.7	746.9	168.7	4.81	0.99	3.82	4.47	35.0
PB Flesh	951.8	216.9	734.9	2.84	1.36	1.48	1.86	0.0
PrB Flesh	687.5	409.6	457.8	3.46	0.86	2.60	1.49	25.0
MF Flesh	698.8	409.6	289.2	2.84	0.86	1.98	7.14	15.0
Con. Flesh	795.2	277.1	518.1	2.96	2.47	0.49	1.49	20.0
MB Peel	734.9	674.7	60.2	8.02	7.28	0.74	1.24	35.0
PB Peel	843.4	783.1	60.4	12.10	8.64	3.46	0.87	0.0
PrB Peel	638.6	506.0	132.5	9.50	5.55	3.95	1.12	25.0
MF Peel	554.2	493.9	60.3	8.15	7.16	0.99	0.56	15.0
Con. Peel	1036.1	698.8	337.4	17.90	14.81	3.09	0.50	20.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

7.2.2 In Taimour cv.

7.2.2.1 In rapid growth stage

Results presented in Table (30) and Fig. (8) show that there was a high reduction of total sugars at all wounded inoculated fruits with ***B. theobromae*** isolates. The highest reduction was recorded by MB isolate where the infection reduced the sugar content in the flesh and peel of the fruits (18.07 and 108.43 µg/g fresh weight respectively) compared with controls. As well as, the infection reduced also the total phenols in each of flesh and peel of inoculated fruits with the same isolate. The amino acids contents were reduced in all infected fruits with ***B. theobromae*** isolates and ***F. moniliforme*** where as the highest content was recorded in healthy ones.

No evidence on reduction of sugars, phenols and amino acids contents in un-wounded fruits inoculated with ***B. theobromae*** and ***F. moniliforme*** compared with controls ones.Data also indicated that there was no infection of all treatments but the quantity of phenols was raised in the peel of fruits to reach 21.6 µg/g fresh weight by ***B. theobromae*** PrB while the content in control was 18.52 µg/g fresh weight. Generally reduced sugars contents were more than in controls at all of wounded and un-wounded fruits.

7.2.2.2 In pre-ripening stage

Data presented in Table (31) and Fig. (8) show also that there was a reduction of the total sugars content of all treated wounded fruits with ***B. theobromae*** isolates in each of fruit's flesh and peel. The highest reduction in sugars was recorded by infection the flesh with PB isolate to reach 84.33 µg/g fresh weight and with MB

Table (30): The relationship between the fungal infection and the chemical composition of Taimour mango fruit cv. rapid growth stage (50 days from fruit set).

Wounded fruits	Sugars µg/g			Phenols µg/g			Amino acids µg/g	Disease %
	Total	Reduc.	Un-red.	Total	Free	Conj.		
MB Flesh+Peel	24.10	6.02	18.08	2.96	0.86	2.10	1.71	100.0
PB Flesh+Peel	72.29	42.17	30.12	7.53	3.95	3.58	1.71	93.3
PrB Flesh+Peel	60.24	48.19	12.05	5.68	2.34	3.34	2.33	96.7
MF Flesh+Peel	19.96	190.96	0.0	12.24	8.76	3.58	1.34	13.3
Con. Flesh+Peel	15.60	96.39	54.21	6.29	2.22	4.07	4.66	0.0
MB Flesh	18.07	6.02	12.05	1.97	1.11	0.86	2.24	100.0
PB Flesh	24.10	6.02	18.08	2.84	1.60	1.24	3.04	93.3
PrB Flesh	36.15	24.10	12.05	2.59	0.74	1.85	1.86	96.7
MF Flesh	108.43	108.43	0.0	3.95	1.97	1.98	0.47	13.3
Con. Flesh	138.55	96.39	42.16	4.94	0.86	4.08	4.04	0.0
MB Peel	108.43	72.29	36.14	11.36	6.54	4.82	1.03	100.0
PB Peel	192.77	192.77	0.0	14.81	9.25	5.56	0.19	93.3
PrB Peel	150.60	114.46	36.14	17.28	11.23	6.05	1.89	96.7
MF Peel	273.49	273.49	0.0	16.08	14.19	1.86	0.47	13,3
Con. Peel	216.87	168.67	48.20	14.19	12.96	1.23	3.79	0.0
Un-woundedfruits								
MB Flesh+Peel	253.01	210.89	42.12	11.11	3.70	7.41	3.17	0.0
PB Flesh+Peel	180.72	156.62	24.10	17.28	9.26	8.02	2.17	0.0
PrB Flesh+Peel	232.53	190.36	42.17	11.85	5.43	6.42	2.17	0.0
MF Flesh+Peel	259.04	240.96	18.08	18.52	9.62	8.90	5.15	0.0
Con. Flesh+Peel	361.45	168.67	192.78	11.60	8.27	3.33	3.73	0.0
MB Flesh	160.24	136.14	24.10	2.71	1.11	1.60	3.60	0.0
PB Flesh	196.38	184.34	12.04	2.34	0.99	1.35	1.96	0.0
PrB Flesh	154.22	142.17	12.05	2.22	0.99	1.23	2.08	0.0
MF Flesh	196.38	178.31	18.07	2.59	0.62	1.97	2.36	0.0
Con. Flesh	192.77	120.48	72.29	5.68	1.60	4.08	5.28	0.0
MB Peel	292.77	214.45	78.32	17.80	12.96	1.84	2.86	0.0
PB Peel	313.25	240.96	72.29	17.90	11.11	6.79	2.42	0.0
PrB Peel	256.06	156.62	108.44	21.60	17.28	4.32	2.67	0.0
MF Peel	319.28	253.01	66.27	17.28	12.10	5.18	4.47	0.0
Con. Peel	283.13	192.77	90.36	18.52	12.34	6.18	2.17	0.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

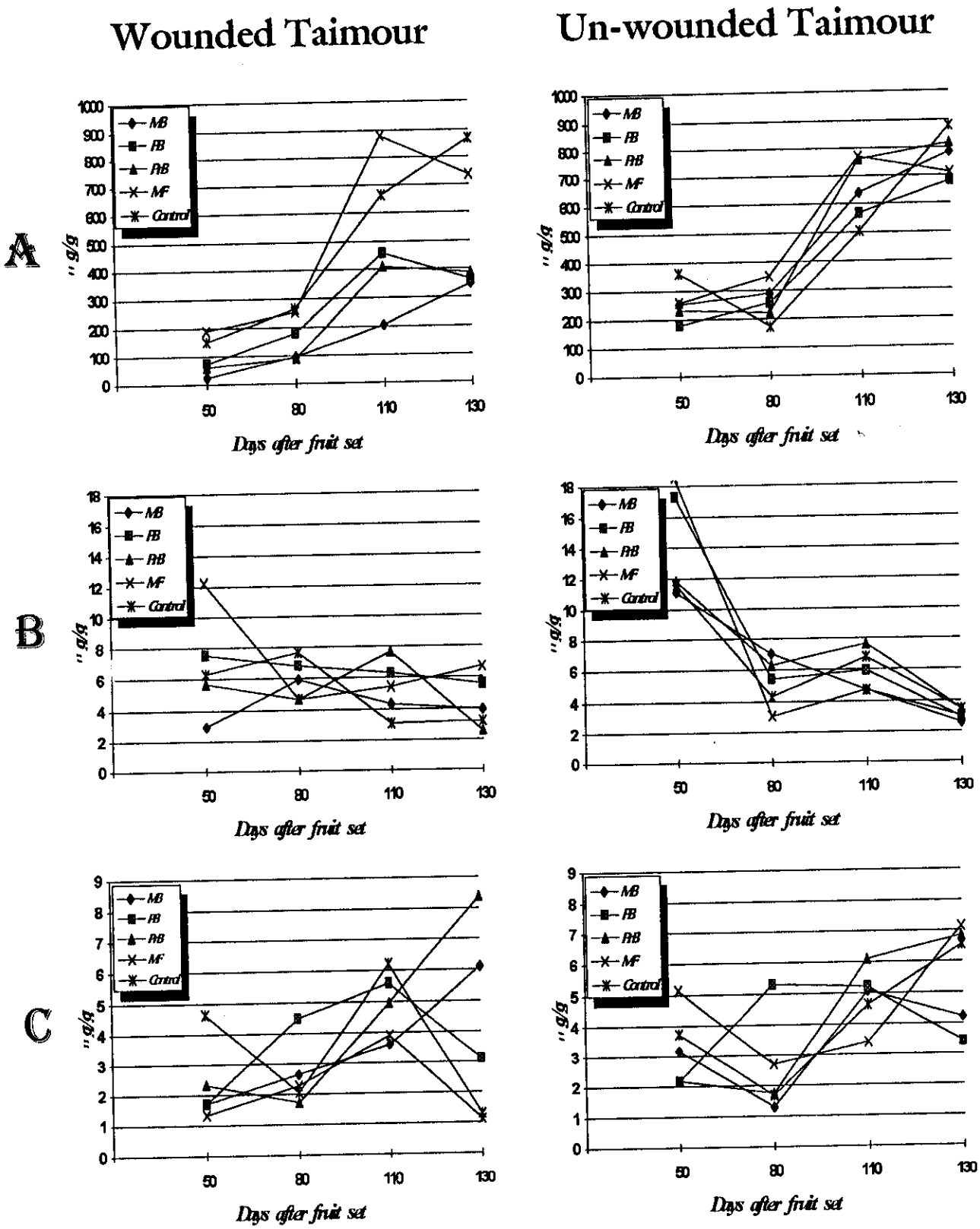

Fig. (8): Chemical changes in wounded and un-wounded mango fruits cv. Taimour at different growth stages (Flesh and Peel).
(A) Total sugars. (B) Total phenols. (C) Total amino acids.

Table (31): The relationship between the fungal infection and the chemical composition of Taimour mango fruit cv. at the pre-ripening stage (80 days from fruit set).

Wounded fruits	Sugars µg/g			Phenols µg/g			Amino acids µg/g	Disease %
	Total	Reduc.	Un-red.	Total	Free	Conj.		
MB Flesh+Peel	96.38	96.38	0.0	5.92	0.98	4.94	2.64	100.0
PB Flesh+Peel	180.72	144.58	36.14	6.79	3.33	3.46	4.50	97.5
PrB Flesh+Peel	90.36	90.36	0.0	4.69	2.96	1.73	1.72	100.0
MF Flesh+Peel	253.01	180.72	72.29	4.69	2.47	2.22	2.27	20.0
Con. Flesh+Peel	265.06	253.01	12.05	7.65	3.45	4.2	2.05	0.0
MB Flesh	90.36	72.28	18.08	3.45	2.59	0.86	3.26	100.0
PB Flesh	84.33	72.29	12.04	3.46	1.85	1.61	3.26	97.5
PrB Flesh	132.53	108.43	24.10	4.81	2.84	1.97	1.12	100.0
MF Flesh	256.06	156.63	108.43	4.32	0.86	3.46	4.81	20.0
Con. Flesh	313.25	156.63	156.62	2.34	0.74	1.60	4.13	0.0
MB Peel	192.77	168.67	24.10	14.81	8.76	6.05	2.08	100.0
PB Peel	198.79	168.67	30.12	11.11	7.04	4.07	3.01	97.5
PrB Peel	240.96	180.72	60.24	15.43	6.66	8.77	1.12	100,0
MF Peel	457.83	325.30	132.53	21.60	12.96	8.64	5.43	20.0
Con. Peel	397.59	361.45	36.14	18.51	16.05	2.46	2.20	0.0
Un-wounded fruits								
MB Flesh+Peel	289.16	277.11	12.05	7.05	3.70	3.95	1.30	0.0
PB Flesh+Peel	265.06	228.91	36.15	5.43	2.47	2.96	5.31	20.0
PrB Flesh+Peel	222.89	216.87	6.02	6.29	3.08	3.24	1.74	20.0
MF Flesh+Peel	349.39	253.01	96.38	3,09	1.11	1.98	2.70	0.0
Con. Flesh+Peel	174.70	162.65	12.02	4.32	2.10	2.22	1.67	0.0
MB Flesh	253.01	228.91	24.10	2.47	0.86	1.61	1.52	0.0
PB Flesh	216.86	192.77	24.75	2.10	0.62	1.48	1.15	20.0
PrB Flesh	192.77	180.72	12.02	3.45	1.36	2.09	3.07	20.0
MF Flesh	337.35	144.58	192.77	2.22	0.49	1.73	3.45	0.0
Con. Flesh	180.72	168.67	12.05	1.60	0.99	0.61	2.33	0.0
MB Peel	445.78	433.73	12.05	12.96	9.26	3.70	1.65	0.0
PB Peel	469.88	433.73	36.15	11.73	10.49	1.24	1.52	20.0
PrB Peel	385.54	349.39	36.15	11.72	8.64	3.08	1.71	20.0
MF Peel	301.20	253.01	48.19	11.36	5.92	5.44	2.21	0.0
Con. Peel	313.25	313.25	0.0	11.28	5.52	5.76	1.86	0.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

infected the peel to reach 192.77 µg/g fresh weight. The high infection reduced also total phenol content at all of wounded fruits infected with ***B. theobromae*** isolates while a little difference was recorded between the quantity of amino acids in decayed and controls fruits.

No clear differences between sugar and phenols quantities in all un-wounded and control fruits inoculated fruits with ***B. theobromae*** and ***F. moniliformae*** isolates.

7.2.2.3 In ripening stage

Results presented in Table (32) and illustrated by Fig (8) show reduction in the total sugar and phenol contents of all treated wounded mango fruits with ***B. theobromae*** isolates in each of fruit's flesh and peel. The highest reduction in sugars phenols and amino acids was recorded by infection with MB isolate.

No clear differences between sugar phenol and amino acid quantities in all un-wounded and controls fruits inoculated with ***B. theobromae*** and ***F. moniliforme*** isolates.

7.2.2.4 In mature ripening stage

Results presented in Table (33) and Fig (8) indicate that there was only a clear reduction of the total sugar contents of all treated wounded and un-wounded mango fruits with ***B. theobromae*** isolates in each of fruit's flesh and peel compared with controls. It is also shown that the infection increased the quantities of reduced sugars of all wounded flesh and peel infected with ***B. theobromae*** isolates compared with control ones.

Table (32): The relationship between the fungal infection and the chemical composition of Taimour mango fruit cv. at ripening stage (110 days from fruit set).

Wounded fruits		Sugars µg/g			Phenols µg/g			Amino acids µg/g	Disease %
		Total	Reduc.	Un-red.	Total	Free	Conj.		
MB	Flesh+Peel	204.82	192.77	12.04	4.32	2.10	2.22	3.60	100.0
PB	Flesh+Peel	457.83	439.76	18.07	6.29	3.08	3.24	5.59	85.0
PrB	Flesh+Peel	409.63	373.49	36.14	7.65	3.70	3.95	4.97	92.5
MF	Flesh+Peel	879.52	662.65	216.87	5.43	2.47	2.96	3.91	25.0
Con.	Flesh+Peel	662.63	397.59	265.06	3.09	1.11	1.98	6.21	0.0
MB	Flesh	277.11	253.01	24.10	0.96	1.54	1.42	3.04	100.0
PB	Flesh	614.46	506.02	108.44	3.45	1.36	2.09	6.83	85.0
PrB	Flesh	421.69	385.54	63.15	2.47	0.86	1.61	4.22	92.5
MF	Flesh	843.37	506.02	337.35	2.10	0.62	1.48	2.42	25.0
Con.	Flesh	734.94	180.72	554.22	2.22	0.49	1.73	5.71	0.0
MB	Peel	228.91	168.67	60.24	1.60	0.99	0.61	0.83	100.0
PB	Peel	457.83	457.83	0.0	11.72	8.64	3.08	2.24	85.0
PrB	Peel	409.63	397,59	12.04	12.96	9.26	3.70	4.53	92.5
MF	Peel	674.70	626.51	48.19	11.73	10.49	1.24	1.30	25.0
Con.	Peel	506.02	493.98	12.04	11.36	5.92	5.44	7.45	0.0
Un-wounded fruits									
MB	Flesh+Peel	638.55	578.31	60.24	4,69	2.47	2.22	5.09	17.5
PB	Flesh+Peel	566.26	481.93	84.33	5.92	0.98	4.94	5.22	0.0
PrB	Flesh+Peel	759.04	385.54	373.50	7.65	3.45	4.20	6.09	0.0
MF	Flesh+Peel	771.08	626.51	144.57	4.69	2.96	1.73	3.42	0.0
Con.	Flesh+Peel	506.02	337.35	168.67	6.79	3.33	3.46	4.66	0.0
MB	Flesh	686.74	445.78	240.96	4.32	0.86	3.46	8.69	17.5
PB	Flesh	698.79	433.73	265.06	3.45	2.59	0.86	3.97	0.0
PrB	Flesh	819.28	662.65	156.63	2.34	0.74	1.60	6.83	0.0
MF	Flesh	903.61	722.89	180.72	4.81	2.84	1.97	5.59	0.0
Con.	Flesh	457.83	313.25	144.58	3.46	1.85	1.61	10.86	0.0
MB	Peel	542.17	518.07	24.10	21.60	12.96	8.64	,79	17.5
PB	Peel	469.88	421.69	48.19	14.81	8.76	6.05	4,04	0.0
PrB	Peel	530.12	421.69	108.43	18.51	16.05	2.46	2,17	0.0
MF	Peel	638.55	337.35	301.20	15.43	6.66	8.77	2,11	0.0
Con.	Peel	397.59	397.59	0.0	11.11	7.04	4.07	6,21	0.0

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

Table (33): The relationship between the fungal infection and the chemical composition of Taimour mango fruit cv. mature at ripening stage (130 days from fruit set).

Wounded fruits	Sugars µg/g			Phenols µg/g			Amino acids	Disease %
	Total	Reduc.	Un-red.	Total	Free	Conj.	µg/g	
MB Flesh+Peel	346.99	307.23	39.76	3.95	3.09	0.86	6.09	95.0
PB Flesh+Peel	361.45	313.25	48.20	5.55	5.18	0.37	3.11	82.5
PrB Flesh+Peel	385.54	373.49	12.05	2.59	1.97	0.62	8.38	75.0
MF Flesh+Peel	734.94	686.75	48.19	6.67	2.72	3.95	1.12	25.0
Con. Flesh+Peel	867.47	325.30	542.17	3.21	2.10	1.11	1.30	5.0
MB Flesh	397.59	331.32	66.27	2.47	0.86	1.61	6.83	95.0
PB Flesh	457.83	391.57	66.27	2.84	1.60	1.24	10.87	82.5
PrB Flesh	168.67	144.58	24.09	1.36	0.99	0.37	7.45	75.0
MF Flesh	867.47	427.71	439.76	3.70	1.11	2.59	3.54	25.0
Con. Flesh	110.43	325.30	783.13	3.09	0.49	2.60	1.93	5.0
MB Peel	266.26	243.37	22.89	4.69	3.33	1.36	10.87	95.0
PB Peel	397.59	379.52	18.07	12.34	5.18	7.16	10.87	82.5
PrB Peel	228.91	192.71	36.14	3.95	3.70	0.25	1.80	75.0
MF Peel	710.84	710.80	0.0	12.34	11.11	1.23	1.12	25.0
Con. Peel	807.23	698.79	108.44	6.91	3.83	3.08	1.62	5.0
Un-wounded fruits								
MB Flesh+Peel	785.05	608.44	144.61	2.60	1.11	1.49	4.23	35.0
PB Flesh+Peel	680.72	542.17	138.55	2.96	1.36	1.60	3.42	45.0
PrB Flesh+Peel	819.28	578.31	240.97	3.46	1.73	1.73	6.83	7.5
MF Flesh+Peel	710.84	385.54	325.30	3.02	1.23	1.79	7.14	21.5
Con. Flesh+Peel	879.52	337.35	542.17	3.46	1.48	1.98	6.52	17.5
MB Flesh	733.73	619.28	114.45	2.97	1.49	1.48	8.69	35.0
PB Flesh	686.74	542.17	144.57	2.47	1.11	1.36	4.47	45.0
PrB Flesh	710.84	602.41	108.43	2.71	0.99	1.72	9.32	7.5
MF Flesh	903.61	253.01	650.60	3.09	2.22	0.87	5.09	21.5
Con. Flesh	542.17	102.41	439.76	1.97	0.49	1.48	3.79	17.5
MB Peel	431.32	389.16	42.16	7.90	7.77	0.13	4.53	35.0
PB Peel	493.98	469.88	24.10	10.05	7.10	2.95	1.55	45.0
PrB Peel	662.65	662.65	0.0	7.23	3.33	4.20	3.04	7.5
MF Peel	530.12	518.07	12.5	5.80	5.43	0.37	1.12	21.5
Con. Peel	710.84	590.36	120.48	7.65	6.78	0.87	2.05	17.5

*MB= Mango isolate *PB= Peach isolate *PrB= Pear isolate *MF= Mango isolate

No differences between the quantities in sugars, phenols and amino acids in all un-wounded and controls fruits inoculated with ***B. theobromae*** and ***F. moniliforme*** isolates.

8. Toxogenic studies

Effect of crude culture filtrates of pathogenic fungi on the appearance of disease symptoms

As shown in Table (34) the crude culture filtrate of ***B. theobromae*** and ***F. moniliforme*** which obtained from PDB and Czapek's media had no toxic properities where no lesions were recorded on the leaves of broad bean cv. Alfred and beans cv. Saxa. On the other hand, a slight effect was recorded by MB crude filtrate taken from PDB on the leaves of broad bean cv Alfred. While, this effect also appeared when the leaves of Alfred broad bean cv. was treated with MB, PB, and MF crude filtrates taken from Czapek's medium.

9. *In vitro* and *in vivo* changes in enzymes produced by pathogenic fungi

Cellulytic and Pectic enzymes play an important role in infection and maceration of the cells for many different fruits to cause at the end soft rot disease of fruits. Thus, this investigation was conducted under *in vitro* and *in vivo* conditions to study the activity of cellulytic and pectic enzymes in the crude culture filtrates of the pathogenic fungi (***B. theobromae*** isolates and ***F. moniliforme***).

Table (34): Effect of crude culture filtrates of pathogenic fungi on the appearance of the disease symptoms

Isolates	PDB				Czapek`s			
	B.b. cv. Alfred		B. cv.Saxa		B.b. cv. Alfred		B. cv.Saxa	
	C. c.f	H.c.f.	C. c.f	H.c.f.	C. c.f	H.c.f.	C.c.f	H.c.f.
B. theobromae (MB)	+---	-	-	-	+---	-	-	-
B. theobromae (PB)	-	-	-	-	+---	-	-	-
B. theobromae (PrB)	-	-	-	-	-	-		-
F. moniliforme (MF)	-	-	-	-	+---	-	-	-
Control	-	-	-	-	-	-	-	-

*- = no effect
*+--- = slight effect
*++-- = moderate effect
*+++- = strong effect
*++++ = very strong effect
*C.c.f. = crud culture filtrate
*H.c.f. = heated culture filtrate

*MB=mango isolate
*PB=peach isolate
*PrB=pear isolate
*MF=mango isolate
*B.b.=Broad bean leaves
*B. =Bean leaves

9.1 -In vitro

9.1.1 Cellulase enzyme produced in culture filtrate by *B. theobromae* isolates and *F. moniliforme*

Data presented in Fig (9) show that ***B. theobromae*** MB isolate has the abillity to produce cellulase in liquid medium contained different carbon sources. The highest quantity of cellulase was produced in liquid medium contained CMC, xylan and cellulose as carbon sources to be 0.09, 0.06 and 0.048 u/ml respectively. No secretion of cellulase enzyme was recorded in medium containing pectin, PGA, glucose and sucrose as a carbon sources at pH 6.8. The highest quantity of cellulase of all pathogenic isolates was 0.099 u/ml produced by ***F. moniliforme*** in medium contained xylan as a carbon source at pH 6.8 after 7 days incubation.

Data presented in Fig. (10) show that the quantities of the cellulase enzyme produced at pH 4.5 were higher than those at pH 6.8. The highest quantity of the enzyme was 0.23 u/ml and secreted by ***B. theobromae*** (MB) isolate in liquid medium contained cellulose as a carbon source followed by 0.22 u/ml by ***F. monliforme*** in the same medium contained xylan as a carbon source. The same medium contained PGA and Glucose were not favourable for producing cellulase enzyme by all of the pathogenic isolates.

9.1.2 Xylanase enzyme produced in culture filtrate by *B. theobromae* isolates and *F. moniliforme*

Results presented in Fig. (11) show that all of ***B. theobromae*** isolates has a big ability to secrete xylanase enzyme by using different carbon sources at pH 6.8 but the highest quantity of the enzyme was recorded by ***B. theobromae*** .

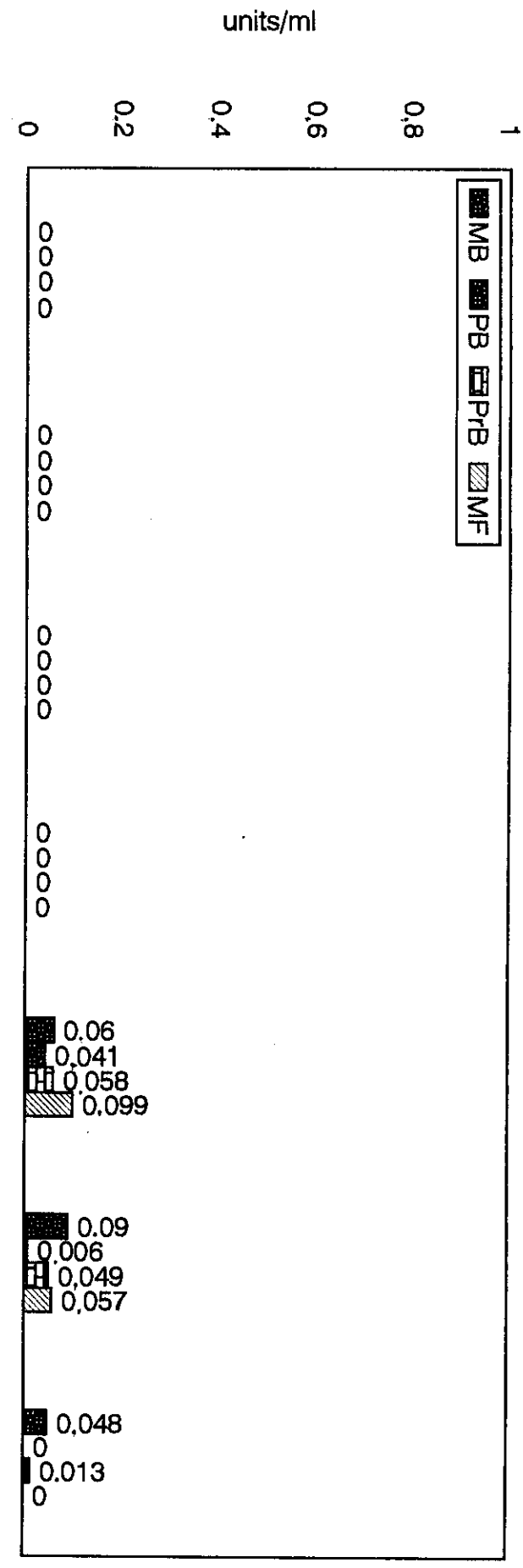

Fig (9) **Cellulase** enzyme produced by ***B. theobromae*** isolates and ***F. moniliforme*** in culture filtrate at pH **6.8**

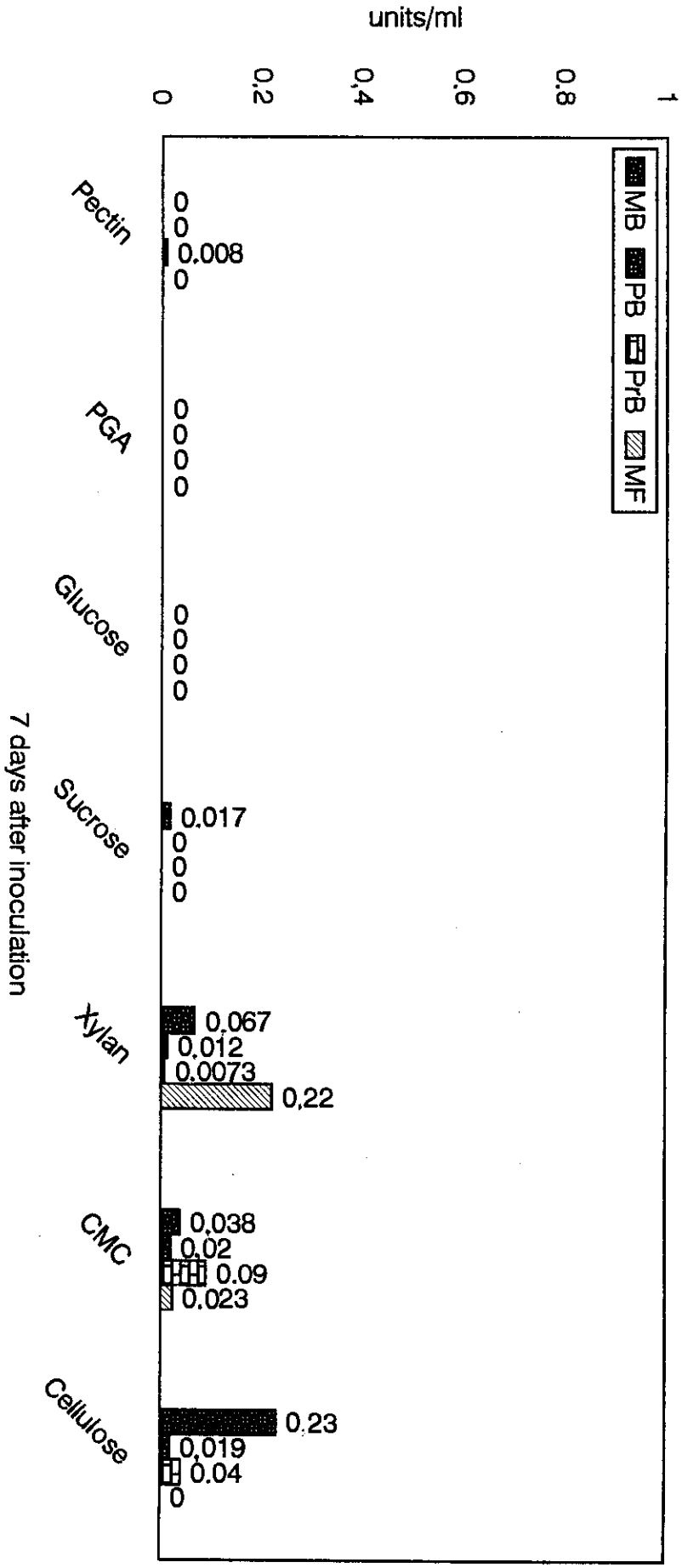

Fig (10) Cellulase enzyme produced by ***B. theobromae*** isolates and ***F. moniliforme*** in culture filtrate at pH **4.5**

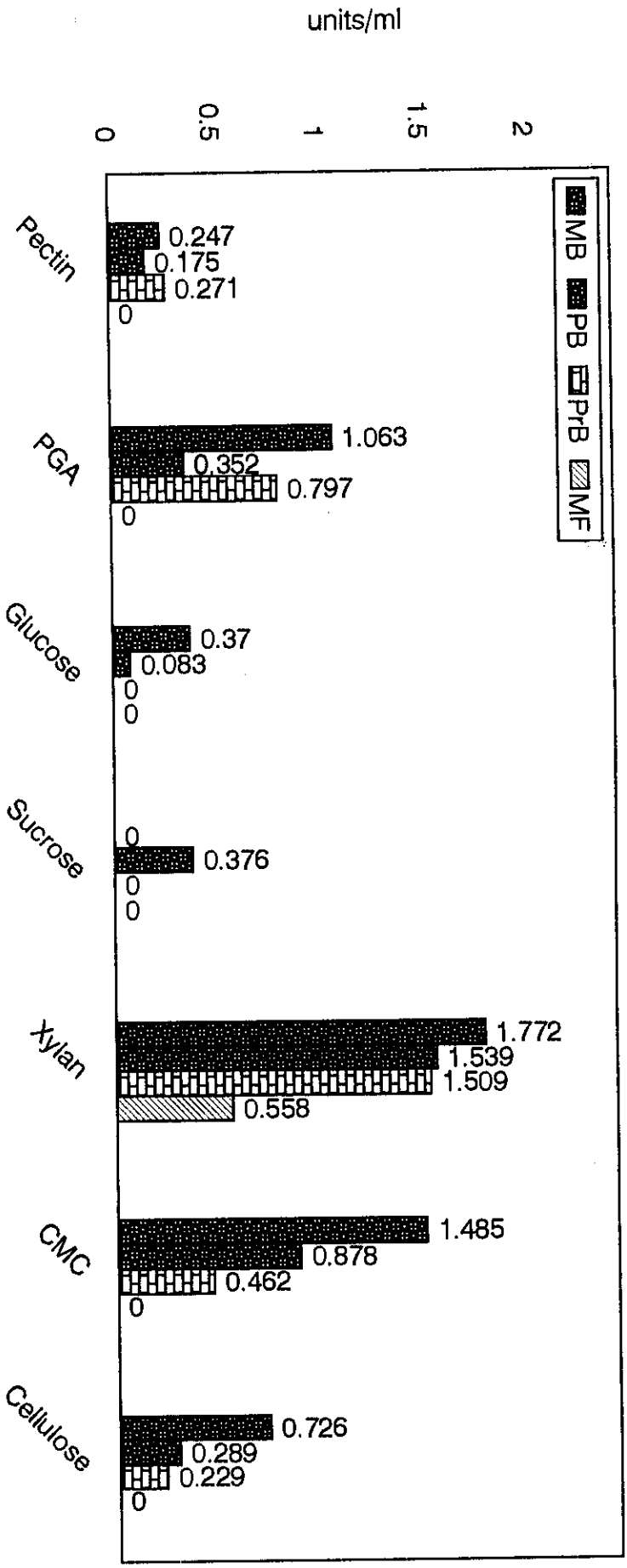

Fig (11) Xylanase enzyme produced by ***B. theobromae*** isolates and ***F. moniliforme*** in culture filtrate at pH **6.8**

(MB) isolate in the media containing xylan, CMC and PGA respectively. No secretion of xylanase enzyme was recorded at the different carbon sources after 7 days from inoculation by ***F. moniliforme*** except in liquid medium contained xylan as a carbon source to be 0.558 u/ml .

Data presented in Fig. (12) show that the quantities of xylanase enzyme produced by ***B. theobromae*** isolates in the liquid medium contained Xylan, CMC and Cellulose as a carbon sources at pH 4.5 were less than the same others at pH 6.8. Only the quantities of xylanase enzyme secreted by ***B. theobromae*** (PrB) isolate were increased at pH 4.5 in the liquid medium contained Xylan, CMC, Cellulose PGA and Pectin. Low quantity of the enzyme was secreted by ***F. moniliforme*** in liquid medium contained Xylan and CMC as a carbon sources at pH 4.5.

9.1.3 PG enzyme produced in culture filtrate of *B. theobromae* isolates and *F. moniliforme*

Results presented in Fig. (13) show that very low quantities of PG enzyme were secreted at pH 6.8 by the ***B. theobromae*** isolates and ***F. moniliforme*** isolates in the liquid medium contained different carbon sources.

Results presented in Fig. (13), Fig. (14) and illusrated by Fig. (15) show that pH 4.5 was more favourable for the production of PG enzyme by the pathogenic fungi ***B. theobromae*** isolates and ***F. moniliforme*** where the quantities of the enzyme were increased to reach 1 u/ml by ***B. theobromae*** (PrB) in liquid medium contained CMC as a carbon source and 0.66 u/ml by ***B. theobromae*** (MB) isolate in the same medium contained cellulose as a carbon source at pH 4.5 after 7 days from inoculation.

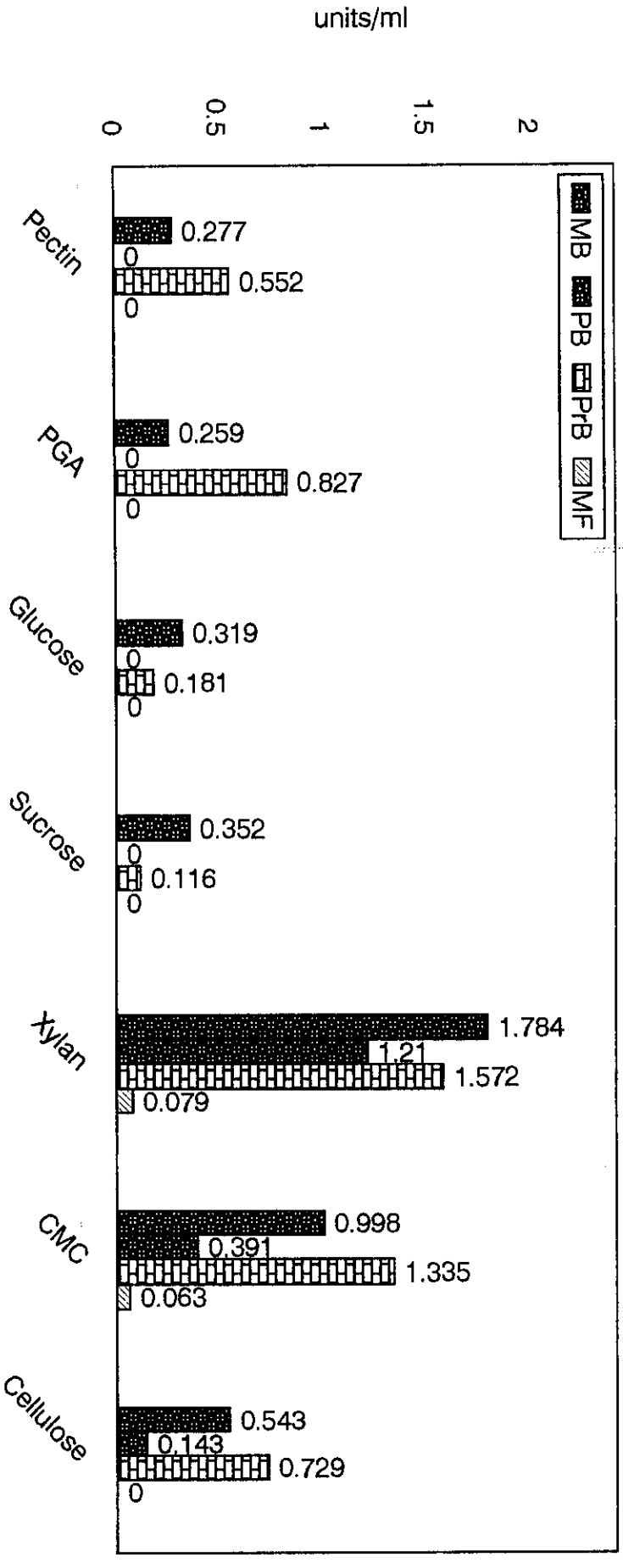

Fig (12) Xylanase enzyme produced by ***B. theobromae*** isolates and ***F. moniliforme*** in culture filtrate at pH **4.5**

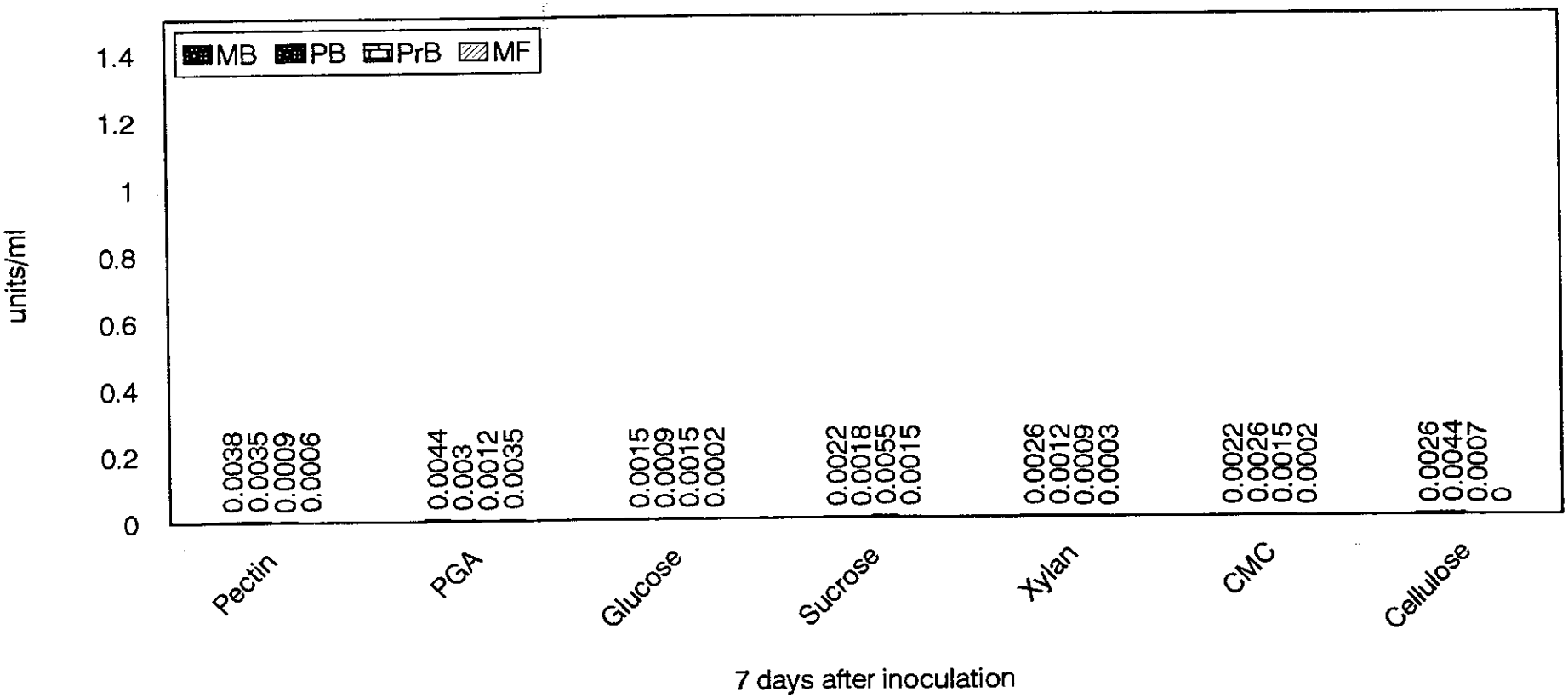

Fig (13) **PG** enzyme produced by ***B. theobromae*** isolates and ***F. moniliforme*** in culture filtrate at pH **6.8**

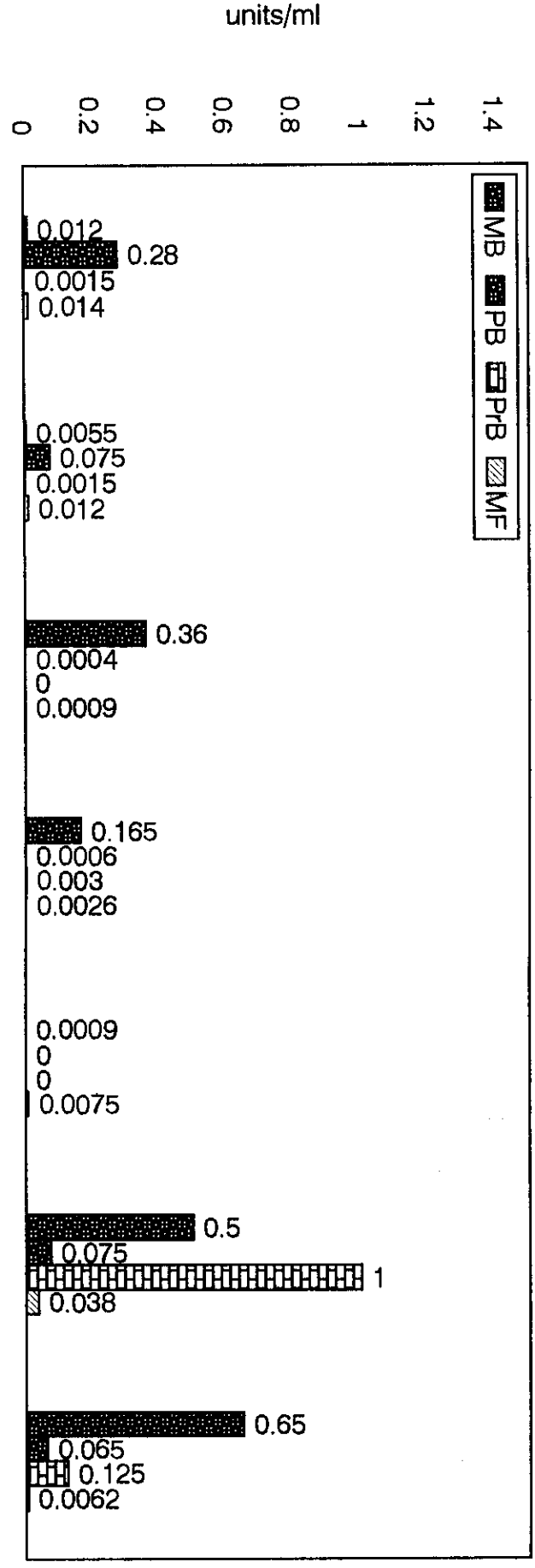

Fig (14) PG enzyme produced by ***B. theobromae*** isolates and ***F. moniliforme*** in culture filtrate at pH **4.5**

Fig. (15) show the secretion of polygalacturonase enzyme at pH 6.8 and 4.5 in culture medium containing different carbon sources (1) **Pectin** (2) **Succrose** (3) **CMC** (4) **Cellulose**

9.1.4 Relationship between the incubation periods and secretion of the tested enzymes by *B. theobromae* (MB) in liquid medium containing Xylan as a carbon source at pH 4.5

Data presented in Fig. (16) show that there were continued increasing in quantities of cellulase and xylanase enzymes in relation to the incubation time of ***B. theobromae*** (MB) in medium contained xylan as a carbon source at pH 4.5 to reach the maximum after 7 days incubation (0.111 and 1.993 u/ml). On the other hand, the maximum quantity of PG enzyme was obtained at 2 days incubation and it decreased again by increasing the incubation period.

9.1.5 Relationship between incubation periods and secretion of tested enzymes by *B. theobromae* (MB) in liquid medium containing CMC as a carbon source at pH 4.5

Data presented in Fig. (17) show that there were continued increasing quantities of Cellulase, Xylanase and PG enzymes in relation to the incubation time of ***B. theobromae*** (MB) in liquid medium contained CMC as a carbon source at pH 4.5 to reach the maximum secretion of the three enzymes at 7 days incubation where the quantities of enzymes were 0.076, 1.221 and 0.3 u/ml respectively.

9.2 In vivo

9.2.1 Production of degradated enzymes Cellulase, Xylanase and PG on infected mango fruits 5 days after inoculation by *B. theobromae* isolates and *F. moniliforme*

Data presented in Fig. (18) and (19) show that the maximum secretion of PG, Xylanase and Cellulase was recorded by ***B. theobromae*** (MB) on infected mango fruits 5 days after inoculation where the quantities of the enzymes were 0.36 , 0.188 and 0.007 u/ml respectively. ***B. theobromae*** (PB) and (PrB) secreted also PG enzyme on infected mango fruits but less than those secreted by ***B. theobromae*** (MB).

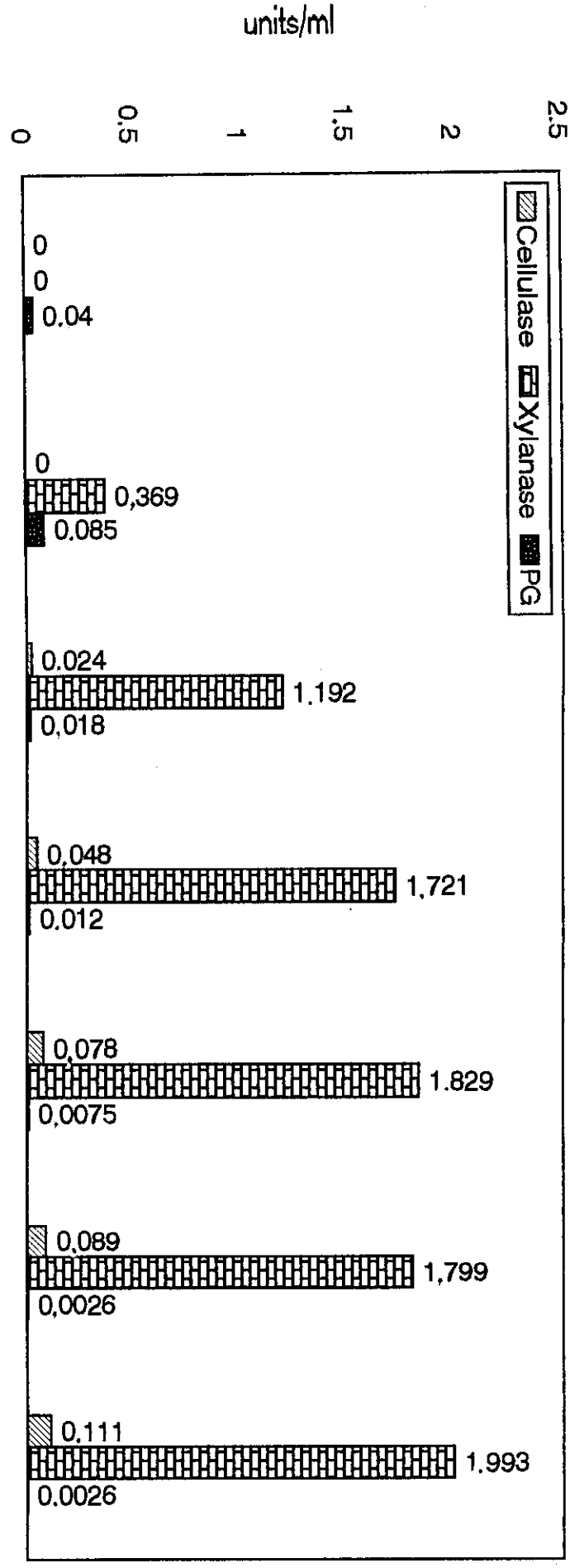

Fig (16) Relationship between the incubation periods and the tested enzymes by ***B. theobromae*** (MB) in liquid medium containing Xylan as a carbon source at pH **4.5**

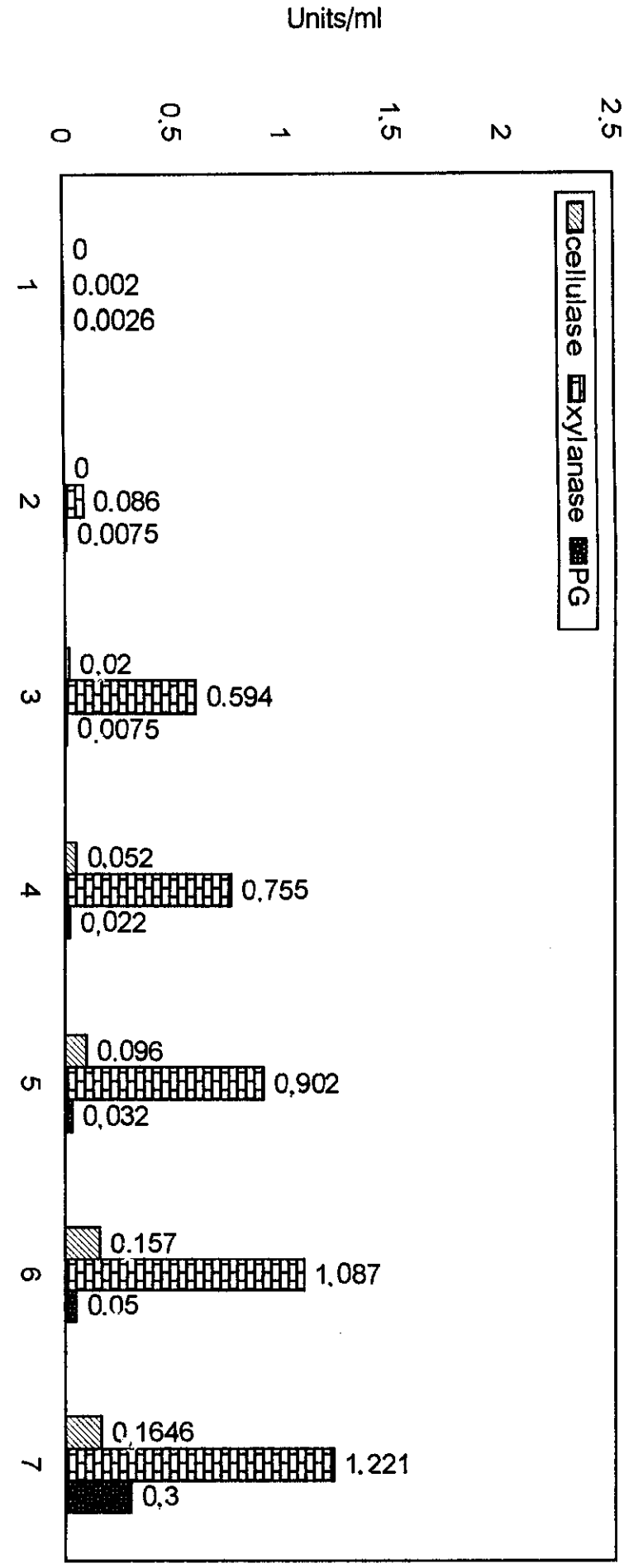

Fig. (17) Relationship between the incubation periods and the tested enzymes by ***B. theobromae*** (MB) in liquid medium containing **CMC** as a carbon source at pH **4.5.**

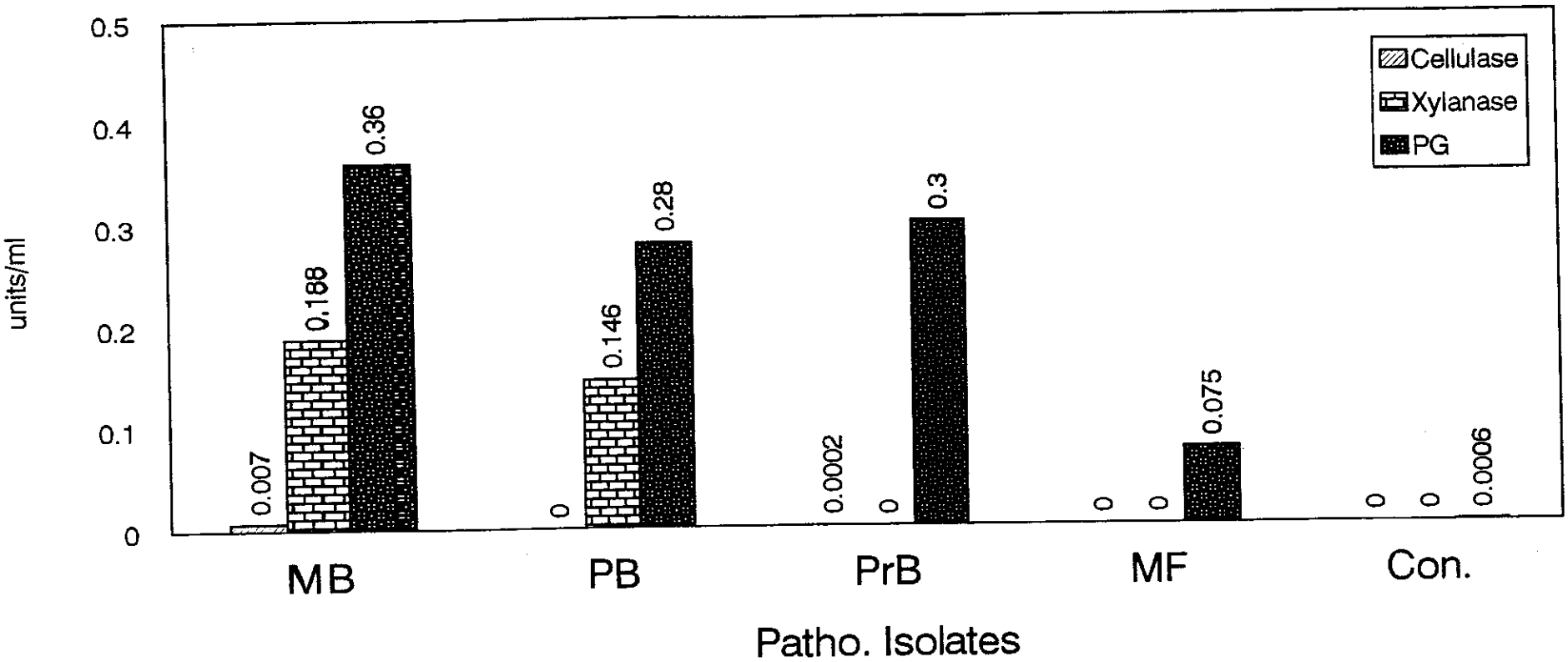

Fig (18) Production of degrading enzymes ***Cellulase***, ***Xylanase*** and ***PG*** in infected mango fruits **5** days after inoculation with different pathogenic isolates

Fig. (19) show the secretion of polygalacturonase enzyme ***in vivo*** by ***B. theobromae*** isolates and ***F. moniliforme***. (C) Control (1) ***B. theobromae*** (Mango isolate) (2) ***B. theobromae*** (Peach isolate) (3) ***B. theobromae*** (Pear isolate) (4) ***F. moniliforme*** (Mango isolate)

9.2.2 Relationship between the incubation periods and secretion of degraded enzymes Cellulase, Xylanase and PG in infected mango fruits with *B. theobromae* (MB).

Results in Fig. (20) show that the maximum quantity of Cellulase was recorded at 2 days after incubation of infected mango fruits with ***B. theobromae*** (MB) to be 0.07 u/ml, while, the maximum quantities of Xylanase and PG were recorded at 4 days from incubation of the same infected mango fruits to be 0.22 and 0.23 u/ml respectively. No detection of the same enzymes was recorded at controls one.

10. Protein assay

10.1 *In vitro*

10.1.1 Total protein in filtrates of *B. theobromae* isolates and *F. moniliforme* growing on liquid media containing different carbon sources at pH 6.8 and 4.5 (7days) after inoculation.

Data presented in Table (35) show that there was high production of total protein in the liquid culture filtrate of medium inoculated with ***B. theobromae*** (MB) at pH 6.8 more than the total protein produced in the same medium adjusted at pH 4.5 at all of used carbon sources where the mean of total protein were 2069.4 and 921.3 µg/ml at pH 6.8 and 4.5 respectively. On the other hand the dry weight of mycellium which was obtained after 7 days incubation at pH 4.5 were more than those obtained at pH 6.8. Although the pH value was adjusted at the begining at pH 6.8 and 4.5 but they changed after inoculation with ***B. theobromae*** (MB) after 7 days incubation as shown in Table (35) as a result to the production of protein.

Data presented in Table (36) show also that there was high production of total protein in the liquid medium inoculated with ***B. theobromae*** (PB) at pH 6.8 more than

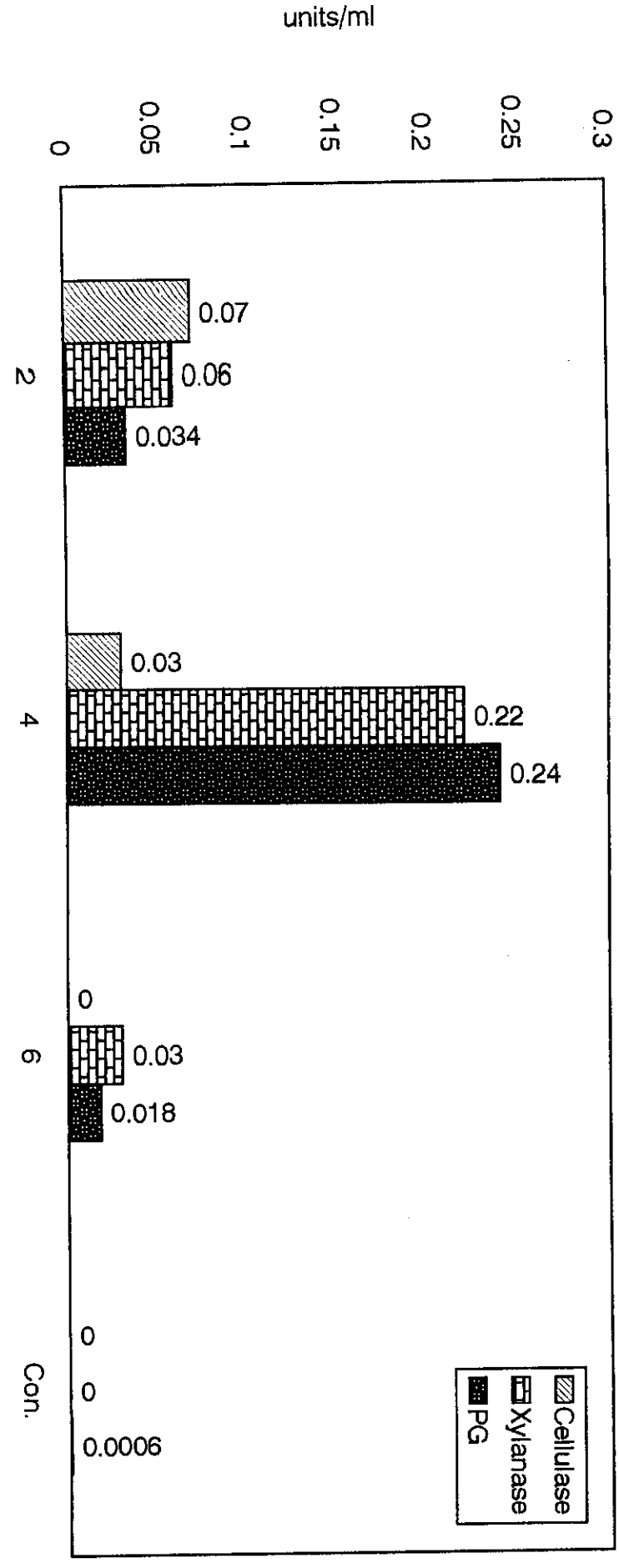

Fig (20) Relationship between incubation periods **and** activity of degrading enzymes in mango fruits infected with ***B. theobromae*** ngo isolate)

Table (35): Total protein in filtrates of ***B. theobromae*** (Mango isolate) growing in liquid media containing different carbon sources at pH **6.8** and **4.5** (7 days) after inoculation

Carbon Sources	D. wt. mycelium mg		pH value		Total protein µg/ml	
Initial pH	**6.8**	**4.5**	**6.8**	**4.5**	**6.8**	**45**
Pectin	0.084	0.114	8.39	7.47	177.6	109.6
PG. A	0.073	0.047	8.63	7.69	301.9	103.0
Glucose	0.192	0.195	8.70	7.88	238.4	138.4
Sucrose	0.297	0.309	8.54	7.37	346.2	176.2
Xylan	0.071	0.078	8.03	7.61	376.4	225.2
CMC	0.028	0.047	7.61	4.97	518.7	120.5
Cellulose	0.155	0.202	6.92	5.45	110.2	48.4
Total					2069.4	921.3

the total protein produced in the same medium adjusted at pH 4.5 at all of the used carbon sources where the mean of total protein were 965.4 and 464.0 µg/ml at pH 6.8 and 4.5 respectively. On the other way the dry weight of mycelium which was obtained after 7 days incubation at pH 4.5 were more than those obtained at pH 6.8. Although the pH value was adjusted at the beginning at pH 6.8 and 4.5 but they changed after inoculation with ***B. theobromae*** (PB) after 7 days incubation as shown in Table (36) as a result to the production of protein.

Data presented in Table (37) show that there was a slight difference between the production of total protein in the liquid medium inoculated with ***B. theobromae*** (PrB) at pH 6.8 and the total protein produced in the same medium adjusted at pH 4.5 at all of used carbon sources where the mean of total protein were 1446.7 and 1450.9 µg/ml at pH 6.8 and 4.5 respectively. Also the dry weight of mycellium which was obtained after 7 days incubation at pH 6.8 were more than those obtained at pH 4.5. Although the pH value was adjusted at the begining at pH 6.8 and 4.5 but they changed after inoculation with ***B. theobromae*** (PrB) after 7 days incubation as shown in Table (37) as a result to the production of protein. On the other way no big changes were recorded of pH 6.8 and 4.5 values at CMC and Cellulose as a carbon sources in the used liquid medium after 7 days incubation.

Data presented in Table (38) show that the production of total protein in the liquid medium inoculated with ***F. moniliforme*** (MF) at pH 6.8 was more than the total protein produced in the same medium adjusted at pH 4.5 at all of used carbon sources where the mean of total protein were 551.5 and 432.4 µg/ml at pH 6.8 and 4.5 respectively.

Table (36): Total protein in filtrates of *B. theobromae* (Peach isolate) growing in liquid media containing different carbon sources at pH **6.8** and **4.5** (7 days) after inoculation.

Carbon Sources	D. wt. mycelium mg		pH value		Total protein µg/ml	
Initial pH	6.8	4.5	6.8	4.5	6.8	4.5
Pectin	0.089	0,102	8.22	4.60	116.4	36.4
PG. A	0.056	0.061	8.48	6.28	98.0	75.9
Glucose	0.121	0.049	7,68	5.91	100.4	54.4
Sucrose	0.093	0.131	7.10	6.96	53.4	100.6
Xylan	0.051	0.119	7.98	7.10	260.4	51.8
CMC	0.028	0.055	7.00	4.89	200.0	122.1
Cellulose	0.060	0.186	6.91	5.41	136.8	22.8
Total					965.4	464.0

Table (37): Total protein in filtrates of ***B. theobromae*** (Pear isolate) growing in liquid media containing different carbon sources at pH **6.8** and **4.5** (7 days) after inoculation

Carbon Sources	**D. wt. mycelium mg**		**pH value**		**Total protein µg/ml**	
Initial pH	**6.8**	**4.5**	**6.8**	**4.5**	**6.8**	**4.5**
Pectin	0.103	0.073	8.18	8.50	217.4	230.8
PG. A	0.048	0.048	8.31	8.73	184.2	219.2
Glucose	0.119	0.107	7.68	8.34	325.6	178.8
Sucrose	0.131	0.146	5.47	7.22	160.7	281.2
Xylan	0.068	0.048	7.55	7.58	176.4	143.5
CMC	0.037	0.038	6.88	5.33	369.0	343.5
Cellulose	0.121	0.079	6.44	5.94	13.4	53.9
Total					1446.7	1450.9

Table (38): Total protein in filtrates of ***F. moniliforme*** (Mango isolate) growing in liquid media containing different carbon sources at pH **6.8** and **4.5** (7 days) after inoculation

Carbon Sources	**D. wt. mycelium mg**		**pH value**		**Total protein µg/ml**	
Initial pH	**6.8**	**4.5**	**6.8**	**4.5**	**6.8**	**4.5**
Pectin	0.095	0.086	8.49	8,53	173.2	55.9
PG. A	0.118	0.059	8.76	8.86	125.2	103.1
Glucose	0.166	0.140	8.56	8.35	58.8	78.2
Sucrose	0.211	0.109	7.84	6.77	91.0	81.0
Xylan	0.144	0.073	7.89	8.05	57.8	62.0
CMC	0.067	0.037	7.13	6.31	36.8	37.8
Cellulose	0.083	0.790	6.51	6.03	8.7	14.4
Total					551.5	432.4

Also the dry weight of mycelium which was obtained after 7 days incubation at pH 6.8 were more than those obtained at pH 4.5. Although the pH value was adjusted at the beginning at pH 6.8 and 4.5 but changed after inoculation with ***F. moniliforme*** (MF) after 7 days incubation as shown in Table (38) as a result to the production of protein.

From the results in Table (35-38) It show that there was big difference between the pathogenic ***B. theobromae*** isolates and ***F. moniliforme*** in production of total protein of the liquid medium which was adjusted at pH 6.8 at the beginning where the highest quantities of protein were recorded by ***B. theobromae*** (MB) followed by ***B. theobromae*** (PrB) to be 2069.4 and 1446.7 µg/ml respectively and the lowest quantities of total protein at pH 6.8 and 4.5 was recorded by ***F. moniliforme*** (MF) to be 551.5 and 432.4 µg/ml after 7 days incubation. On the other way the highest quantity of total protein at pH 4.5 was carried out by ***B. theobromae*** (PrB) to be 1450.9 µg/ml after the same incubation time.

10.1.2 Relationship between the incubation periods and producing of protein in liquid culture of medium containing Xylan as a carbon source for *B. theobromae* (MB) at pH 4.5

Results presented in Table (39) show that the protein quantity was increased with the increasing of incubation period where it was 17.4 µg/ml after one day and reaching 274.0 µg/ml after 7 days incubation and in the same trend increased also the pH value after inoculation to be 5.41 after one day to reach 7.83 after 7 days incubation. Also dry weight of mycelium of ***B. theobromae*** (MB) increased after 1 to 7 days in relation to the incubation period of the liquid medium containing xylan as a carbon source.

Table (39): Relationship between the incubation periods and producing of protein in liquid medium containing CMC and/or Xylan as carbon sources for ***B. theobromae*** (mango isolate) at pH **4.5**

Incubation time	**D.wt. mycellium mg**		**pH value**		**Total protein µg/ml**	
	CMC	**Xylan**	**CMC**	**Xylan**	**CMC**	**Xylan**
1	0.018	0.013	4.95	5.41	60.7	17.4
2	0.018	0.029	4.96	6.21	40.7	23.0
3	0.027	0.026	5.13	6.57	59.9	47.5
4	0.038	0.046	5.22	7.28	73.8	61.0
5	0.051	0.066	5.26	7.55	77.2	11.0
6	0.062	0.086	5.27	7.68	132.8	140.6
7	0.060	0.090	5.29	7.83	356.2	274.0

10.1.3 Relationship between the incubation periods and producing of protein in liquid culture of medium containing CMC as a carbon source for *B. theobromae* (MB) at pH 4.5

Results presented in Table (39) also show that the protein quantity was increased with the increasing of incubation time where it was 60.7 µg/ml after one day to be 356.2 µg/ml after 7 days incubation and increased also the obtained quantities of dry weight of mycelium of ***B. theobromae*** (MB) after 1 to 7 days in relation to the incubation time of the liquid medium contained CMC as a carbon source. On the other hand the pH value increased slowly after 1 to 7 days where it was 4.95 after one day to be 5.29 after 7 days incubation.

10.2 *In vivo*

10.2.1 The quantity of protein in one gram fresh weight of healthy and infected mango fruits with pathogenic isolates after 5 days from inoculation.

Results presented in Table (40) show that the quntity of protein was reduced in infected mango fuits with the pathogenic isolates comparatively with the healthy ones while there was no big difference of pH values in infected and healthy tissues.

11. Chemical Control

The effect of different concentrations of fungicides on linear growth and sporulations of the pathogenic fungi under laboratory conditions was studied. The effect of some fungicides on the mango fruits in orchards under in vivo conditions was also taken.

Table (40): The quantity of protein in one gram fresh weight of healthy and infected mango fruits with pathogenic isolates after 5 days from inoculation.

Isolates	pH value	Total protein µg/ml
***B. theobromae* (MB)**	4,11	41,48
***B. theobromae* (PB)**	4,55	46,39
***B. theobromae* (PrB)**	3,78	49,57
***F. moniliforme* (MF)**	3,94	47,41
Healthy tissues	3,87	62,11

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate

11.1 *In vitro*

11.1.1 Effect of different concentrations of fungicides on the linear growth of *B. theobromae* isolates and *F. moniliforme.*

Data in Table (41) show that the used fungicides, i.e. Benlate, Topsin, Vitavax, Rovral, Dithane M-45, Ridomil-MZ and Trimeltox-forte with the different concentrations prevented the growth of the pathogenic fungi onto nutiernt media after 2 and 4 days from inoculation in relation to control. On the other hand, Bayleton and cupravit were less suppressive against the pathogenic isolates where the fungi could grow on the nutiernt media of the highest concentration.

11.1.2 Effect of fungicides with different concentrations on pycnidial formation and sporulation of *B. theobromae* and *F. moniliforme*

Reslts presented in Table (42) show that the pathogenic ***B. theobromae*** isolates could produce pycnidia in the presence of Bayleton and Cupravit at different concentrations. Pycnidia was produced on the poisoned media with Trimeltox-forte at concentration 585µg/ml after 9 days incubation while the others fungicides, Benlate, Topsin, Vitavax, Rovral, Dithane M-45 and Ridomil-MZ prevented the pycnidial formation till 9 days incubation of the pathogenic ***B. theobromae*** isolates at the different used concentrations. On the other hand, all of previous fungicides were effective against the sporulation of ***F. moniliforme*** and the high concentration of all fungicides was more effective than the others compared with control ones.

Table (41): Effect of fungicides with different concentrations on linear growth (mm) of pathogenic *B. theobromae* isolates and *F.moniliforme*.

Fungicides	Concen.	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF) spore/ml	
d.p.i.	µg/ml	2	4	2	4	2	4	2	4
Control	0	40	90	51	90	50	90	14	33
Bayleton	31.25	19	47	31	69	25	61	7	21
	62.6	14	34	24	51	21	61	6	19
	93.75	14	27	18	41	19	55	7	17
Trimeltox-forte	585	6	7	8	10	8	10	6	10
	1170	6	7	6	10	6	7	7	9
	1755	6	6	6	8	7	9	7	13
Cupravit	1050	7	15	20	61	7	23	8	9
	2100	9	22	19	66	8	25	6	8
	3150	7	14	17	61	7	20	6	6
Ridomil-MZ	580	6	6	6	6	6	6	6	6
	1160	6	6	6	6	6	6	6	6
	1740	6	6	6	6	6	6	6	6
Dithane.M-45	1000	6	6	6	6	6	6	6	7
	2000	6	6	6	6	6	6	6	7
	3000	6	6	6	6	6	6	6	7
Rovral	500	6	6	6	6	7	9	8	10
	1000	6	6	6	6	6	7	8	9
	1500	6	6	6	6	6	6	7	10
Vitavax	500	6	9	6	7	6	6	6	6
	1000	6	6	6	6	6	6	6	6
	1500	6	6	6	6	6	6	6	6
Topsin-70	500	6	7	6	7	6	7	6	7
	1000	6	7	6	7	6	7	6	7
	1500	6	6	6	6	6	7	6	7
Benlate	250	6	6	6	6	6	7	6	8
	500	6	6	6	6	6	7	6	7
	750	6	6	6	6	6	7	6	7
*Tukey-HSD 5% >=		0.178	0.215	0.162	0.323	0.109	0.243		

*MB= Mango isolate
*PB= Peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.= Days post inoculation

Table (42): Effect of fungicides with different concentrations on pycnidial formation and sporulation of pathogenic ***B. theobromae*** isolates and ***F.moniliforme***.

Fungicides	Concen.	*B. theobromae* (MB)		*B. theobromae* (PB)		*B. theobromae* (PrB)		*F. moniliforme* (MF)spore/ml
d.p.i.	µg/ml	6	9	6	9	6	9	7
Control	0.0	386.7	626.7	246.7	453.3	285.7	529.3	17.550.000
Bayleton	31.25	14.7	80.0	0.7	10.3	0.0	44.0	4.825.000
	62.6	0.0	49.0	0.0	9.7	0.0	34.3	4.175.000
	93.75	4.3	27.0	0.0	2.3	0.0	18.0	1.800.000
Trimeltox-forte	585	0.0	2.3	0.0	3.3	0.0	11.0	14.650.000
	1170	0.0	0.0	0.0	0.0	0.0	2.0	1.650.000
	1755	0.0	0.0	0.0	0.0	0.0	0.0	0.850.000
Cupravit	1050	3.6	5.0	11.7	35.7	1.0	7.0	2.425.000
	2100	3.3	6.3	7.3	18.7	0.7	6.7	0.775.000
	3150	6.0	8.3	3.3	5.0	2.0	4.0	0.000.000
Ridomil-MZ	580	0.0	0.0	0.0	0.0	0.0	0.0	14.225.000
	1160	0.0	0.0	0.0	0.0	0.0	0.0	11.600.000
	1740	0.0	0.0	0.0	0.0	0.0	0.0	4.625.000
Dithane-M-45	1000	0.0	0.0	0.0	0.0	0.0	0.0	6.975.000
	2000	0.0	0.0	0.0	0.0	0.0	0.0	4.600.000
	3000	0.0	0.0	0.0	0.0	0.0	0.0	0.700.000
Rovral	500	0.0	0.0	0.0	0.0	0.0	0.0	15.250.000
	1000	0.0	0.0	0.0	0.0	0.0	0.0	9.000.000
	1500	0.0	0.0	0.0	0.0	0.0	0.0	7.575.000
Vitavax	500	0.0	0.0	0.0	0.0	0.0	0.0	1.200.000
	1000	0.0	0.0	0.0	0.0	0.0	0.0	0.600.000
	1500	0.0	0.0	0.0	0.0	0.0	0.0	0.250.000
Topsin-70	500	0.0	0.0	0.0	0.0	0.0	0.0	2.175.000
	1000	0.0	0.0	0.0	0.0	0.0	0.0	1.350.000
	1500	0.0	0.0	0.0	0.0	0.0	0.0	0.525.000
Benlate	250	0.0	0.0	0.0	0.0	0.0	0.0	1.325.000
	500	0.0	0.0	0.0	0.0	0.0	0.0	0.755.000
	750	0.0	0.0	0.0	0.0	0.0	0.0	0.650.000
*Tukey-HSD 5% >=		12.04	9.71	8.11	4.03	6.96	7.47	

*MB= Mango isolate
*PB= peach isolate
*PrB= Pear isolate
*MF= Mango isolate
*d.p.i.= Days post inoculation

11.2 *In vivo*

11.2.1 Effect of two fungicides on mango fruit rot in orchards

Data presented in Table (43) indicate that the two selected fungicides Dithane M-45 and Ridomil-MZ were not effective on setting of mango fruits in orchards where the percentages of setting mango fruits were increased gradually from 1 to 3 sprays but this increase was not more than control ones at the first season. In the second season, Dithane M-45 and Ridomil-MZ were more effective and improved the percentages of setting mango fruits where three sprays were more effective than the others and control ones as shown in the Table (43) where the setting fruits after three sprays was 25 and 43.5% respectively while it was 23.4% of controls.

11.2.2 Effect of fungicidal treatment on rots appearence of stored fruits at room temperature.

Results presented in Table (44) indicate that the rots percentages were high on un-treated mango fruits with selected fungicides which were harvested after 30 days from the late spray when stored at room temperature where the infections were 41.7 and 50% after 7 and 10 days respectively from harvesting.While, no or slight infection was recorded on the treated fruits with Dithane M-45 and Ridomil-MZ at three sprays where the infection was 0% till 7 days after harvesting and increased only by Ridomil-MZ to reach 6.25% after 10 days from harvesting. It seems to be also that one spray had a slight effect against rot's appearence on stored mango fruits.

Table (43): Effect of two fungicides on mango fruit rot in orchards

Sprays	Dithane M-45 % Number of setting mango fruits				Ridomil-MZ % Number of setting mango fruits			
Reading date	27/5	27/6	27/7	27/8	27/5	27/6	27/7	27/8
First season 89-90								
27 /5/ 1991	100	22.6	13.4	13.4	100	40.0	27.5	27.5
27 /6/ 1991	100	72.4	51.7	51.7	100	36.4	28.9	28.9
27 /7/ 1991	100	54.8	48.4	48.4	100	43.9	43.9	43.9
Control	100	57.6	57.6	57.6	100	57.6	57.6	57.6
Second season 90-91								
23 /5/ 1991	100	63.6	18.2	18.2	100	38.5	15.4	15.4
23 /6/ 1991	100	28.0	24.0	24.0	100	39.3	32.1	32.1
23 /7/ 1991	100	25.0	25.0	25.0	100	43.5	43.5	43.5
Control	100	40.4	27.7	23.4	100	40.4	27.7	23.4

Table (44): Effect of fungicidal treatment on rots appearence of stored fruits at room temperature.

Sprays	% Diseased fruits after storage fore 7 days	% Diseased fruits after storage fore 10 days
Redomil MZ-58%		
S_1	25.0	50.0
S_2	6.25	18.75
S_3	0.0	6.25
Dithane M-45		
S_1	25.0	33.0
S_2	16.7	25.0
S_3	0.0	0.0
Control	41.7	50.0

S = number of sprays