OCCURRENCE OF *PYTHIUM* SPECIES IN CULTIVATED SOILS IN THE WEST BANK AND GAZA STRIP: A PRELIMINARY REPORT

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ملخـــــص

درست فطريات الـ *Pythium* في ٣٨ تربة زراعية موزعة في أجزاء الضفة الغربية وقطاع غزة المختلفة باستخدام وسط انتقائي وطريقة التلقيح السطحي للاطباق . عزل من هذه الاتربة ٢٣ نوعا ، ١٦ منها تملك اكياسا بوغية كروية مع او بدون احسام هيفية وتشكل ٩٢ بالمئة من مجموع وحدات تكاثر الفطر في هذه الاتربة . وتملك الانواع الباقية من الـ *Pythium* اكياسا بوغية خيطية أو مفصصة . وقد وجد بأن مستويات الفطر في المناطق الجغرافية المدروسة مختلفة بدرجة كبيرة . واعطت منطقة نابلس أعلى مستوى من مجتمعات الفطر تليها مناطق جنين وبيت لحم واريحا وطولكرم وغزة والخليل على التوالي . كما كانت مستويات انواع الفطر واعدادها مختلفة بدرجة ملحوظة في المناطق المختلفة . وتناقش الدراسة العلاقات بين مستويات مجتمعات الفطر وتواجدها وعوامل التربة واستخداماتها الزراعية .

ABSTRACT

The *Pythium* flora of 38 soils from different sections of the West Bank and Gaza Strip was determined using a selective agar medium and a surface - soil - dilution plating technique. A total of 23 species were recovered. Sixteen of these species possessed subglobose sporangia and/or hyphal swellings and constituted 92 % of the total number of *Pythium* propagules. The remaining species had filamentous or lobulate sporangia. Considerable differences in population levels in the different localities were found. The Nablus locality harboured the highest mean level of *Pythium* propagules followed by the localities in Jenin, Bethlehem, Jericho, Tulkarm, Ram Alla, Gaza Stip, and Hebron. Solis

in the different localities differed also in population levels and composition of species. Associations between *Pythium* population levels and soil factors and agricultural practices are discussed.

INTRODUCTION

Species of *Pythium* are ubiquitous in the world, many are found in soil living saprophytically or parasitically [19,5,15] Some *Pythium* spp are among the most destructiove plant patogens[1]. Their role as plant pathogens depends on factors such as inoculum density[4], soil temperature and pH[8]. Therefore knowledge of the pattern of distribution of the inoculum density of *Pythium* spp should be of concern to plant pthologists and mycologists.

Only few reported literature on thr distribution of *Pythium* spp in soil is available throughout the world [21,17,2] and none dealing with such distribution in Jordan. The aim of the present study is to provide quatitative and qualitative information on the distribution of *Pythium* spp in cultivaed soils in the West Bank and Gaza Strip.

EXPERIMENTAL

For the study thirty eight fields were chosen at random throughout the West Bank and Gaza Strip (Fig.1). Twenty five of the thirty eight fields were irrigated and were either under citrus or vegetables (for more than 10 yerars) whereas 13 fields were nonirrigated and were either under vegetables after cereals or vines (for more than 5 years). Soil characteristics are given in Table 1.

Soil samples were collected during 24th March - 24th April 1983. Each field was sampled once by taking four samples, each weighing approximately 250g, at a depth of 0 - 10 cm from an area of $4m^2$. The samples were put in a plstic bag, and brought immediately back to the laboratory where the composite sample was throroughly mixed. Two 50g aliquots of soil were weighed and dried overnight at 105° C to determine soil moisture contents. The remaining soil was divided into 3 nearly equal parts and a soil suspension in 0.09% sterile water agar prepared for each using 50g subsamples. Soil dilutions, 1:50, 1:00, 1:250 or 1:500 were used depending on anticipated *Pythium* population densities in the soils smpled.

For the purpose of determining the population of *Pythium* spp the VP_3 medium 2 and the surgace soil - dilution plating techinque were use. The selective medium contained sucrose 20g; $MgSO_4 \cdot 7H_2O$ 10mg; $ZnCl_2$ 1mg; thiamin HCL 100mg; Difco corn meal agar 17g; Oxoid No. 1 agar 23g; PCNB 100mg; rose bengal 2.5mg; penicillin-G 50000 units; pimaricin 5mg, and 1 liter demineralized water. 1ml. aliquots of the appropriate dilution were added to the surface of plates of the selective medium and spread over the agar surface with a sterile bent glass rod. The replicate plates were prepared for each subsample. The plates were then incubated at 22° in the dark, as pimaricin is sensitive for light[18], for about 40h, rinsed with slowly running tap water and colonies of *Pythium* marked and counted. Mean numbers of *Pythium* propagules g^{-1} D.W. were calculated for each replicate soil sample. *Pythium* isolates were identified using the keys of Middleton[12], Waterhouse[22], and Plaats- Niterink[15] together with the original descriptions of new species not included in these monographs[2] (c.f Ali[3]. Representative isolates of all *Pythium* species isolated from the west Bank and Gaza Strip are maintained at the Fungus Culture Collection of An-Najah University (see Appendix 1).

RESULTS AND DISCUSSION

Detailed results are shown in Table 2. Summarised date are shown in Tables 3 and 4.

Table 1. Soil Characteristics

Locality	Field no.	Field Category*	Soil pH	Soil type	%Clay	%Soil moisture	%Oraganic matter
Jenin	9	C	8.2	clay	70.3	32.2	4.8
	10	B	8.2	clay	78.3	32.4	1.2
	11	A	7.5	clay	82.3	35.2	0.9
	12	B	7.6	clay	70.1	26.8	1.4
	13	B	7.4	clay	54.7	36	0.9
Tulkarm	14	C	8.0	clay	54.3	31	15.6
	15	A	8.0	clay	49.1	28	5.5
	16	A	7.5	clay	53.6	16.4	5.1
	19	C	7.5	clay	52.4	36.2	5.5
	20	A	7.4	clay	51.2	26.4	4.8
Nablus	1	C	8.0	clay	55.9	32.6	11.0
	2	A	8.2	clay	63.9	33.2	5.1
	6	A	8.2	clay	54.7	23.2	2.8
	7	A	8.2	clay	50.7	22.2	1.2
	8	B	8.0	clay	74.7	28	4.4
Jericho	3	A	8.1	clay	59.9	23.6	2.4
	4	C	8.2	clay	47.9	19	3.4
	5	A	8.2	clay	46.7	22.4	14.5
Ram Alla,	40	B	7.9	clay	57.1	19.8	4.8
	41	D	7.6	clay	60.1	16.6	2.5
	44	B	8.0	clay	62.3	12.2	1.8
Bethlehem	34	A	7.6	clay	66.1	22.8	7.1
	36	A	7.6	clay	65	23.2	6.4
	37	A	7.8	clay loam	39.9	28	9.2
	38	D	7.4	clay	61.1	13.4	1.6
	39	B	8.0	clay	61.1	14.2	0.5
Hebron	27	D	8	clay	49.1	11	1.8
	28	B	7.9	clay	55.9	15.4	0.7
	30	A	7.5	clay	56.1	18	4.8
	31	A	7.8	clay	57.1	21	4.6
	32	D	8.0	clay	55.9	12.2	3.0
	61	D	8.1	clay	61.1	7.6	1.8
Gaza	21	C	8.3	loamy sand	13.1	2.4	0.5
	22	A	8.2	loamy sand	13.1	8.6	0.5
	23	A	7.6	clay	52.3	4.4	1.1
	24	A	7.6	clay	53.1	10	1.4
	25	A	8.2	clay	53.1	8.6	1.4
	26	C	8.0	sandy clay loam	21.1	8.4	4.4

* A (irrigated soils under vegetables); B (non-irrigated soils under vegetables); C (irrigated soils under citrus); D (non-irrigated soils under vines).

Table 2. Numbers of *Pythium* propagules g -1 D.W. from cultivated soils in the West Bank and Gaza Stip

Locality	Field	P. group H.S.	P. rost-ratum	P. ulti-mum	P. oliga-ndrum	P. spp *	Tot.
Jenin	9	274	175	25	–	125	599
	10	123	25	–	–	25	173
	11	180	77	–	–	155	412
	12	–	–	–	–	–	–
	13	599	26	–	–	52	677
Tulkarm	14	24	–	–	–	–	24
	15	208	46	–	–	46	300
	16	20	–	–	–	–	20
	19	26	26	–	–	78	130
	20	–	–	23	–	23	46
Nablus	1	223	50	544	–	249	1066
	2	565	74	98	–	25	762
	6	22	109	22	22	238	413
	7	129	107	107	–	191	534
	8	162	162	–	69	–	393
Jericho	3	65	22	–	–	–	87
	4	41	–	–	–	21	62
	5	107	64	22	–	44	237
Ram Alla	40	–	–	–	–	–	–
	41	–	–	–	–	–	–
	44	86	–	–	57	48	191
Bethlehem	34	65	–	–	11	33	109
	36	239	22	–	77	33	371
	37	232	46	35	81	24	418
	38	106	29	10	19	10	174
	39	–	–	–	–	–	–
Hebron	27	19	9	–	–	–	28
	28	10	10	–	20	–	40
	30	–	–	10	–	20	30
	31	11	–	11	–	21	43
	32	–	–	–	–	–	–
	61	4	–	–	4	4	12
Gaza	21	14	7	–	–	–	21
	22	18	–	–	–	4	22
	23	7	–	59	–	7	73
	24	–	–	15	–	–	15
	25	1	–	18	–	4	37
	26	4	–	–	4	–	8

* *P.* spp - (*P. minor*, *P.* group F & L, *P. parvum*, *P. lutarium*, *P. vexans*, *P. irregulare*, *P. dissimile*, *P. middletonii*, *P. orthogonon*, *P. paroecandum*, *P. periplocum*, *P. pulchrum*, *P. spinosum*, *P. splendens*, *P. salpingophorum*, *P. tracheiphilum*, *P. vanterpoolii*, and *P. aphanidermatum*).

Table 3. Comparison of occurrence of *Pythium* species (propagules g $^{-1}$ D.W.) from the eight localities of the West Bank and Gaza Strip

Geographic Source										
Species	Nablus	Jenin	Bethlehem	Jericho	Tulkarm	Dar Alla'	Gaza Strip	Hebron	Mean	% of sites in which the species was found.
Pythium "group H.S"	220.2	235.2	128.4	71	55.6	28.7	9.6	7.3	94.5	79
P. rostratum	100.4	60.6	19.4	28.7	14.4	--	1.2	3.2	28.5	50
P. ultimum	154.2	5	9	7.3	4.6	--	15.3	3.5	24.9	37
P. oligandrum	18.2	--	37.6	--	--	19	0.7	4	9.9	26
P. spp*	104.6	71.4	20	21.2	29.4	16	2.5	7.5	38.6	
Total	633.6	372.2	214.4	128.7	104	63.7	29.3	25.5	196.4	
Total number of taxa	17	8	10	6	7	3	7	7		

* The same as in Table 2.

Of the 23 species recovered, 16 possessed subglobe sporangia and/or hyphal swellings and made up 92% of total number of propagules, and 7 possessed filamentous or lobulate sporangia and composed 8% of total propagule number. The percentage of *Pythium* isolates that produced sexual reproductive structures was 49%'

The soils sampled can be divided into categories: irrigated soils and non-irrigated soils (Table 4). The F-test applied to the means of propagules of *Pythium* from soils of the two categories showed that the irrigated soils had significantly ($P \leq 0.01$) higher mean number of propagules.

Table 4. Total *Pythium* propagules from irrigated and non-irrigated soils.

	Number of fields	Mean number of Propagules g. D.W.	% Soil moisture	% Soil organic matter
Irrigated fields:	25	233.6	21.5	5.1
under citrus	7	267.6	23.3	6.4
under vegetables	18	218.3	20.3	4.4
Non-irrigated fields :*	12	84.3	17.9	2.1
under vegetables	7	113.9	21.2	2.1
under vines	5	42.8	12.2	2.1

* Field 13 was excluded because it was water-logged when soil samples were collected.

As a result of the investigation, twenty three species of *Pythium* were recovered from the thirty eight fields sampled. All of these species are recorded for the first time from soils in the West Bank and the Gaza Stip. Of these species, only two (P. *aphanidermatum* and *P. oligandrum*) were previously recorded from Palestine [16,6] and one at East Bank of Jordan[11]. Isolates of *P.* group (H.S.) comprised about 48% of all *Pythium* isolates recovered, and were found in 79% of the soils. Isolates of *Pythium rostratum, P. ultimum, and P. oligandrum* comprised 14%, and 5% of all *Pythium* isolates recovered respectively, and were found in 50% and 26% of the 38 soils sampled, respectively. The other eighteen species were less abundant and less frequently isolated.

Soils in the different localities of the West Bank and the Gaza Strip varied considerably in their mean levels of *Pythium* propagules, species composition, and species abundance (Table 3). The Nablus locality had the highest mean level of *Pythium* propagules, followed by the localities in Jenin, Bethlehem, Jericho, Tulkarm, Ram Alla, the Gaza Strip, and Hebron. The Nablus locality provided the highest number of species (17), followed by the fields in Bethlehem (10), Jenin (8), Tulkarm, and the Gaza Strip (each giving 7 species), Jericho (6), and Ram Alla, (3). The Nablus locality yielded the highest mean number of propagules of *Pythium rostratum and P. ultimum.* These species comprised nearly 40% of total *Pythium* propagules in soils from this locality. The fields in Jenin had the highest mean total propagules of *P.* group (H.S.). Propagules of this last group comprised about 79% of the total *Pythium* propagules in soils in this locality. *Pythium oligandrum* constituted a significant proportion (ca 18%) of the total propagules of *Pythium* in soils at Bethlehem.

It is known that *Pythium* species are common in cultivated and non - cultivated soils[8,2] but have been found to be most common and most abundant in the former[12,2]. Several soil factors, such as soil temperature[8], moisture[19,13,2] pH, type[9], organic mater contents[17] and vegetation, are known to influence the level of *Pythium* population in soil. The higher levels of *Pythium* propagules found in irrigated soils as compard with non - irrigated soils can be partially attributed to the higher soil moisture content and higher organic matter content in these soils (Table 4). High soil moisture provides an appropriate environment for nutrient diffusion and is thought to be necessary for survial, spore germination, and saprohytic activities of *Pythium* species in soil[17,20]. The higher organic matter content in the irrigated soils also my encourage greater microbial activity including that of *Pythium* than in the less fertile non - irrigated soils[10]. Soil texture and soil pH showed no obvious correlation with levels of *Pythium* species in the soils studied. Levels of *Pythium* propagules in soils varied considerably in relation to soil vegetation (Table 4). Soils under citrus yieldéd the highest mean level of propagules, followed by soils under vegetables and soils under vines. A more thorough survey should allow comparisons to be made between populations of *Pythium* species in different fields.

The data presented in this paper (Tables 2 and 3) apparently correlate with those of Hendrix & Campbell[7], Robertson,[17], Plaats - Niterink[14] and Ali[2], who found *P. ultimum*, *P. oligandrum and P. rostratum* and other species with subblobose sporangia and/or hyphal swellings to dominate cultivated soils in the continental United States, New Zeland, the Netherlands and in England, respectively.

APPENDIX 1

THE FUNGAL CULTURE COLLECTION OF AN–NAJAH UNIVERSITY

(F.C.C.A.U)

A fungal culture collection has been established at An-Najah National University. This consists mainly of oomycetous fungi (mostly pythiaceaus) and dermatophytes. Maintenance methods and lists of fungal species preserved at the collection are reported. The collection is aimed at providing a reference for researchers and students of fungi.

Many isolates of *Pythium* spp were recovered from field soil and infected plant parts, in the West Bank and Gaza Strip. In addition several isolates of dermatophytes were also recovered from dermatophytosis patients from the West Bank (Shtayeh & Arda, *Mycopathologia*, *92*, 59-62 (1985)).

Representative isolates of each *Pythium* sp recovered have been maintained mainly in water cultures in 100ml conical flasks[2] or sometimes on cornmeal agar slants[8,9] in 100 ml universal bottles. Cultures are kept at 5 - 10° C and are subcultured twice a year. Also, representative isolates of the dermatophytes have been maintained on Sabouraud's glucose agar slants. Cultures are kept at 5 - 10° C and are subcultured every six months with the exception of *Epidermophyton floccosum*, *Trichophyton violaceum* and *T. schoenleini* which are subcultured every three months since they do not survive refrigeration for a long time. Usually two stock cultures are made for each fungal isolate kept at the collection. For the purpose of organization each fungal culture is given a reference code that includes name of the culture collection (FCCAU), a number for the genus (1 for *Pythium*, 2 for *Microsporum* 3 for *Epidermophyton* and 4 for *Trichophyton)*, a number for the species (01 .... n), and a number for the isolate (.01 - .n).
The following fungal isolates have been deposited in the collection.
Section 1. *Pythium* spp.

Pythium acanthicum Drechsler 1930: FCCAU 101.1, FCCAU 101.2, FCCAU 101.3, ex soil, 1984; FCCAU 101.6, ex *Malus sylvestris* (L.) Mill, 1983.

Pythium anandrum Drechsler 1930: FCCAU 139.1, ex *Lantana* sp., 1984; FCCAU 139.2, ex stream water, 1984; FCCAU 139.3, ex stream bed.

Pythium aphanidermatum (Edson) Fitzp. 1923: FCCAU 102.24, FCCAU 102.27, ex eggplant roots, 1984; FCCAU 102.26, ex *Cucurbita* sp. roots, 1984; FCCAU 102.25, ex *Citrus* roots.

Pythium coloratum Vaartaja 1965: FCCAU 103.1; FCCAU 103.2, FCCAU 103.3, FCCAU 103.4, FCCAU 103.5, ex soil, 1984; FCCAU 103.6, ex *Raphanus sativus L.; FCCAU 103.7, ex Lens culinaris* Medik, 1984.

Pythium condidiophorum Jokl 1918: FCCAU 115.1, ex soil, 1984; FCCAU 115.2, FCCAU 115.3, exstream bed, 1984.

Pythium debaryanum Hesse 1874: FCCAU 104.1, FCCAU 104.2, ex soil, 1984; FCCAU 104.3, ex *Psidium guayava* L., 1984.

Pythium deliense Meurs 1934: FCCAU 105.1, FCCAU 105.2, FCCAU 105.3, ex soil, 1984.

Pythium dissimile Vaartaja 1965: FCCAU 106.1, FCCAU 106.2, FCCAU 106.3, FCCAU 106.4, FCCAU 106.5, ex soil, 1984; FCCAU 106.6, ex *Vicia fabae*, 1984.

Pythium dissotocum Drechsler 1930: FCCAU 136.1, ex soil, 1984; FCCAU 136.4, ex *Lens culinaris* Medik, 1984.

Pythium echinulatum Matthews 1931: FCCAU 127.1, FCCAU 127.2, FCCAU 127.3, ex soil, 1984.

Pythium graminicola Subramaniam 1928: FCCAU 141.1, FCCAU 141.2, FCCAU 141.3, ex soil, 1984.

Pythium intermedium de Bary 1881: FCCAU 107.1, FCCAU 107.1, ex soil, 1984; FCCAU 107.2, ex Rosa sp, 1984.

Pythium irregulare Buisman 1927: FCCAU 108.1, ex soil, 1982; FCCAU 108.2, ex soil, 1984; FCCAU 108.3, ex *Vicia fabae*, FCCAU 108.4, *ex Viola tricolor* FCCAU 108.5, ex *Euphorbia pulcherriama*, 1984.

Pythium iwayamai S. Ito 1935: FCCAU 109.1, FCCAU 109.2, FCCAU 109.3, ex olive roots, 1984; FCCAU 109.4, ex soil, 1982; FCCAU 109.5, ex soil, 1984; FCCAU 109.6, ex tomato roots, 1984.

Pythium lucens Ali-Shtayeh, 1985. FCCAU 130.1, ex soil, 1984.

Pythium lutarium Ali-Shtayeh, 1985. FCCAU 110.1, FCCAU 110.2, FCCAU 110.3, FCCAU 110.4, FCCAU 110.5, FCCAU 110.6, FCCAU 110.7, ex soil, 1984.

Pythium mamillatum Meurs 1928: FCCAU 128.1, FCCAU 128.2, FCCAU 128.3, ex soil, 1984.

Pythium middletonii Sparrow 1960: FCCAU 111.1, FCCAU 111.2, FCCAU 111.3, FCCAU 111.4, FCCAU 111.5, FCCAU 111.6, FCCAU 111.7, ex soil, 1984.

Pythium minor Ali-Shtayeh, 1985. FCCAU 112.1, 1982; FCCAU 112.2, F112.3, FFCAU 112.4, FCCAU 112.5, FCCAU 112.6, FCCAU 112.7, ex soil, 1984.

Pythium monospermum Pringsh. 1858: FCCAU 113.1, FCCAU 103.2, FCCAU 103.3, ex soil, 1982.

Pythium nagaii S. Ito & Tokunga 1933: FCCAU 144.1, FCCAU 144.2, ex stream bed, 1985.

Pythium oligandrum Drechsler 1930: FCCAU 114.39, FCCAU 114.40, FCCAU 114.41, FCCAU 114.42, FCCAU 114.43, FCCAU 114.44, FCCAU 114.45, FCCAU 114.46, ex soil, 1984.

Pythium pachycaule Ali-Shtayeh, 1985. FCCAU 116.1, ex soil, 1985.

Pythium paroecandrum Drechsler 1930: FCCAU 117.1, FCCAU 117.2, ex soil, 1982.

Pythium papillatum Matthews 1928; FCCAU 146.1, FCCAU 146.2, ex stream bed, 1985.

Pythium parvum Ali-Shtayeh, 1985. FCCAU 118.1, ex soil, 1983; FCCAU 118.2, ex *Citrus* roots, 1983; FCCAU 118.22, ex soil, 1984.

Pythium periplocum Drechsler 1930: 138.1, ex soil, 1984.

Pythium pulchrum Minden 1915: FCCAU 129.1, FCCAU 129.2, ex soil, 1984.

Pythium pyrilobum Vaartaja 1965: FCCAU 131.1, FCCAU 131.2, ex soil, 1984.

Pythium rostratum Butler 1907: FCCAU 119.1, ex soil, 1983; FCCAU 119.21, FCCAU 119.23, FCCAU 119.24, ex soil, 1984.

Pythium salpingophorum Drechsler 1930: FCCAU 120.1, FCCAU 120.2, FCCAU 120.3, FCCAU 120.4, ex soil, 1984.

Pythium splendens Braun 1925: FCCAU 121.1, ex *Citrus* roots, 1983; FCCAU 121.2, FCCAU 121.8, ex soil, 1984, FCCAU 121.9, FCCAU 121.10, ex *Cucurbita* sp. roots 1984.

Pythium sylvaticum Campbell & Hendrix 1967: FCCAU 132.1, FCCAU 132.2, FCCAU 132.3 (oogonial), FCCAU 132,4 (antheridial), ex soil, 1984.

Pythium torulosum Coker & Patterson 1927: FCCAU 133.1, ex soil, 1984.

Pythium tracheiphilum Matta 1965: FCCAU 137.1, ex soil, 1984.

Pythium ultimum var. *sporangiiferum* Drechsler 1960: FCCAU 122.1, FCCAU 122.2, FCCAU 122.3, ex soil, 1984.

Pythium ultimum var. *ultimum* Trow 1901: FCCAU 123.1, FCCAU 123.2, FCCAU 123.3, FCCAU 123.4, ex soil, 1982; FCCAU 123.71, ex soil, 1984, FCCAU 123.72, FCCAU 123.73, ex eggplants roots, 1984; FCCAU 123.74, FCCAU 123.75, FCCAU 123.76, FCCAU 123.77, ex *Cucurbita* sp. roots, 1984, FCCAU 123.79, ex *Citrus* roots, 1984.

Pythium vanterpoolii Kouyeas & Kouyeas 1963: FCCAU 125.1, FCCAU 125.2, FCCAU 125.7, FCCAU 125.8, FCCAU 125.9, ex soil, 1984.

Pythium vexans de Bary 1896: FCCAU 126.1, ex soil, 1982; FCCAU 126.2, FCCAU 126.5, FCCAU 126.6, FCCAU 126.7, FCCAU 126.8, ex soil, 1984.

Pythium group F (see Ali, 1985): FCCAU 134.1, FCCAU 134.2, FCCAU 134.3, FCCAU 134.4, FCCAU 134.5, FCCAU 134.6, ex soil, 1984.

Pythium group L (see Ali 1985): FCCAU 135.1, FCCAU 135.2, ex soil, 1984.

Pythium group H.S. (see Ali 1985): FCCAU 124.41, FCCAU 124.42, FCCAU 124.43, FCCAU 124.43, FCCAU 124.44, FCCAU 124.45, FCCAU 124.46, ex soil, 1984, FCCAU 124.47, ex eggplant roots, 1984.

Section 2 *Dermatophytes*
Microsporum gypseum (Bodin) Guiart and Grigorakis 1928: FCCAU 201.1, FCCAU 201.2, 1983; FCCAU 201.3, 1984.

Microsporum canis Bodin 1902: FCCAU 203.46, FCCAU 203.47, FCCAU 203.53, 1983.

Epidermophyton floccosum (Harz) Langeron and Milochevitch 1930: FCCAU 301.6, FCCAU 301.7, FCCAU 301.8, FCCAU 301.9, FCCAU 301.10, 1984.

Trichophyton mentagrophytes. (Robin) Blanchard 1896: FCCAU 401.1, FCCAU 401.2,1983; FCCAU 401.3, FCCAU 401.4, FCCAU 401.5, 1984.

Trichophyton rubrum (Castellani) Sabouraud 1911: FCCAU 402.1, FCCAU 402.2, (a,b), FCCAU 402.3, 1983; FCCAU 402.5, FCCAU 402.6, FCCAU 402.7, 1984.

Trichophyton schoenleinii (Lebert) Langeron and Milochevitch 1930: FCCAU 403.6, FCCAU 403.7, FCCAU 403.8 (a,b), FCCAU 403.9, 1984.

Trichophyton simii (Pinoy, 1912) Stockdale, Mackenzie and Austwick 1965: FCCAU 404.1, FCCAU 404.2, 1983.

Trichophyton verrucosum Bodin 1902: FCCAU 405.1, FCCAU 405.2, 1983; FCCAU 405.3, FCCAU 405.4, 1984.

Trichophyton violaceum Bodin 1902: FCCAU 406.29, FCCAU 406.30, FCCAU 406.31, FCCAU 406.32, FCCAU 406.33, FCCAU 406.34, FCCAU 406.35, FCCAU 406.36, FCCAU 406.37, 1983; FCCAU 406.38, FCCAU 406.39, 1984.

Trichophyton yaoundei Cochet et al 1957: FCCAU 407.1, 1983.

Trichophyton tonsurans Malmsten 1845: FCCAU 408.6, FCCAU 408.7, FCCAU 408.8, FCCAU 408.9, FCCAU 408.10, 1983; FCCAU 408.11, FCCAU 408.12, 1984.

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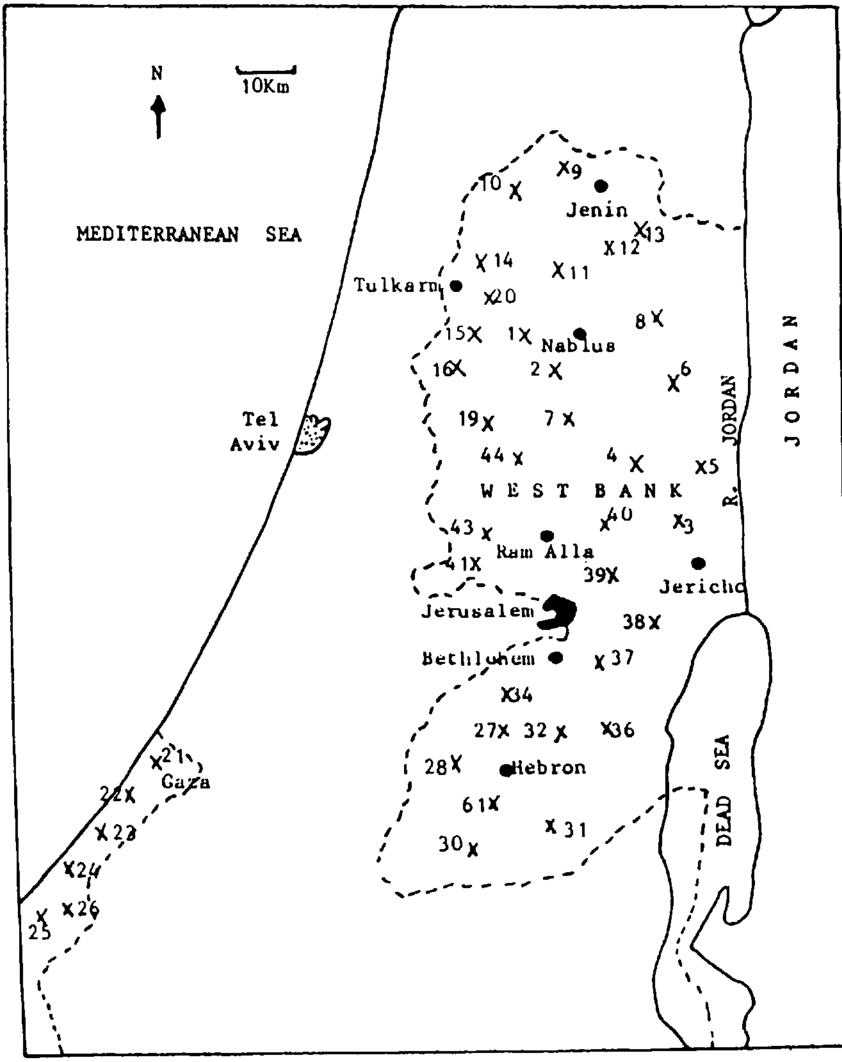

Fig. 1 Map of the West Bank and the Gaza Strip showing sampling sites.