

PHYLLOSHERE AND PHYLLOPLANE FUNGI OF SOME HERBAL PLANTS BELONGING TO LABIATAE, SOLANACEAE AND UMBELLIFERAE IN EGYPT

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الفطريات المنتشرة على سطح وفي داخل أوراق بعض النباتات العشبية

التابعة للعائلات الشفوية والباذنجانية والخيمية في مصر

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استهدفت الدراسة عمل مسح شامل عن مدى تواجد وإنتشار الفطريات سواء على اسطح أو في داخل أوراق خمسة عشر نوعاً من اشهر النباتات العشبية المنتشرة في مصر تمثل ثلاث عائلات نباتية (خمس أنواع من كل عائلة) هي الشفوية والباذنجانية والخيمية، أوضحت الدراسة أن كل العينات المختبرة ملوثة بالفطريات حيث تم عزل ٧٧ نوعاً وأربعة أصناف تنتمي إلى ٣٧ جنساً فطرياً من كل العينات المختبرة وذلك على نوعين من الأوساط الغذائية عند درجة حرارة $28 \pm 2^{\circ}\text{C}$ ، وكانت أكثر الأجناس الفطرية الملوثة لتلك النباتات انتشاراً هي ألترناريا واسبرجلس و كلادوسبورم، أما أكثر الأنواع الفطرية التابعة لتلك الأجناس فكانت : ألترناتا وأسبرجيلس فلافس وفيوميجانس واسبرجلس ونيجو، و كلادوسبورم كلادوسبورويدس.

وقد وجد أن عدد الأجناس والأنواع الفطرية المنتشرة على أسطح الأوراق أكثر من تلك المنتشرة في داخل الأوراق لكل النباتات المختبرة، وكان عدد الأجناس والأنواع الفطرية المعزولة من محيط الورقة أكثر من تلك المعزولة من سطح الورقة، وكان تعداد الفطريات على الوسط الغذائي الدايكلوران - كلورا ميفانيكول - بيتون آجار أقل من تلك المعزولة على الوسط الغذائي الجلو كوز كزابكس آجار كما وجد أن العديد من الأجناس والأنواع الفطرية قد تم عزلها فقط على الوسط الغذائي الجلو كوز كزابكس آجار وأن الأنواع الفطرية التابعة للفطريات الداكنة والفيوزارم تمثل الجزء الأكبر من الفلورا الفطرية المعزولة على الوسط الغذائي الدايكلوران - كلورا ميفانيكول - بيتون آجار

Key Words: Phyllosphere fungi, Phylloplane fungi, Labiatae, Solanaceae, Umbelliferae.

ABSTRACT

Survey on the occurrence of phyllosphere and phylloplane fungi on leaves surface of 15 different kinds of fresh herbs (three samples of each kind) belonging to three plant families (five kinds belonging to each of Labiatae, Solanaceae and Umbelliferae) showed that all samples were colonised by a wide range of fungi. Seventy seven species and four varieties belonging to 37 genera of fungi were isolated and identified from all the samples grown on glucose Czapek agar (GCA) and dichloran chloramphenicol peptone agar (DCPA) media at $28 \pm 2^{\circ}\text{C}$. *Alternaria*, *Aspergillus* and *Cladosporium* were the most common genera of fungi isolated from hosts of the three families. *Alternaria alternata*, *Aspergillus flavus*, *A. fumigatus*, *A. niger* and *Cladosporium cladosporioides* were the most prevalent species. The numbers of genera and species of phyllosphere fungi were higher than those of phylloplane fungi isolated. The total fungal counts estimated on DCPA was less than those on GCA media. Numerous genera and species were recovered only on GCA medium. Dematiaceous hyphomycetes and *Fusarium* species constituted the major part of the mycoflora isolated on DCPA medium.

INTRODUCTION

Herbal plants have been used in medicine to cure diseases and heal injuries. Recently, renewed interest has been shown in the use of medicinal herbs and plants in health care. There has also been a growing awareness by governments of the importance of medicinal plants in health care systems in many developing countries. Several kinds of herbs are also used in minute quantities to enrich, alter or mask the flavour of food (1).

Contamination of herbal plants by fungi leads to great economic losses. A wide variety of fungal toxins constitute a major public health hazard. Uncleaned herbs may contaminate food (2) and contamination of food by microbial herbs lead to food spoilage or even lead to food poisoning.

Only a limited number of investigations of the mycoflora of herbal plants has been carried out in Egypt (1, 3). The aim of this investigation is to study the distribution of the phyllosphere and phylloplane fungi of 45 different samples belonging to 15 species of herbal plants representing three families (five species of each of the Labiatae, the Solanaceae and the Umbelliferae). Most of these species are indigenous, naturalized or cultivated in Egypt. Also, these plants contain drugs which are traditionally used as medicine in Egypt and several parts of the world.

MATERIALS AND METHODS

Fifteen different species of herbaceous plant (three fresh samples of each species) belonging to three plant families (five species of each of the Labiatae, Solanaceae and Umbelliferae) were collected from different areas in the Assiut Governorate. The Arabic, English, Latin, and family names of the different species of herbs are given in Table 1. The leaves of each plant (200 g) were collected at random and placed in a sterile polyethylene bag, sealed and put in another bag which was also sealed. Storage of herb leaves

in a double-bag container minimize the loss of water content and allows sufficient aeration. The leaves were transferred immediately to the laboratory and kept in a cool place (5°C) for fungal determination. The samples were examined with minimum of delay. Two different types of media were used for isolation : Glucose Czapek agar (5) and Dichloran chloramphenicol peptone agar (6). Five replicates were used for each medium. All dishes were incubated at $28 \pm 2^\circ\text{C}$ for 8 days and the fungi were counted, identified and calculated.

1- Phyllosphere fungi

Ten grams of each leaf segment was placed in a sterile conical flask (250 ml) containing 100 ml sterile distilled water. Flasks were shaken by hand in a rotating motion for 10 min. 10 ml of the suspension were transferred, using sterile Menzies (4) dipper, to a known volume of sterile distilled water until the desired final dilution. Each suspension was shaken by hand for about five min. 1 ml of the final appropriate dilution was transferred aseptically into a sterile Petri-dish and the agar medium, cooled to just above the solidifying temperature, was poured. The plates were rotated by hand in a broad swirling motion so that the dilution was dispersed in the agar medium.

2. Phylloplane fungi

Leaves were subjected to a series of washing with sterile distilled water. They were dried thoroughly between sterile filter paper and cut into equal segments (1 cm² each). Three segments were placed on the surface of the agar medium in each dish.

Isolates were purified by subculturing in new agar plates and identified on the basis of their macroscopic and microscopic characteristics (5,7-10). Occasionally identification of fungal species was done from the culture of the original Petri dish.

Table (1) :
The different arabic, english, latin and family names of the different herb kinds collected during this study :

No.	Arabic	English	Latin	Family
1	ريحان	Basil	<i>Ocimum basilicum L.</i>	Labiatae
2	بردقوش	Marjoram	<i>Majorana hortensis L.</i>	
3	النعناع	Peppermint	<i>Mentha piperita L. var. officinalis L.</i>	
4	حصا لبان	Rosemary	<i>Rosmarinus officinalis L.</i>	
5	زعتر	Thyme	<i>Thymus vulgaris</i>	
1	الباذنجان	Aubergine	<i>Solanum melongena L.</i>	Solanaceae
2	الداتور	Datura	<i>Datura stramonium L.</i>	
3		(Thorn apple)		
4	السكران	Henbane	<i>Hyoscyamus muticus L.</i>	
5	عنب الديب	Night shade	<i>Solanum nigrum L.</i>	
5	الشطه	Red pepper	<i>Capsicum frutescens L.</i>	
1	الكرابية بلدي	Caraway	<i>Carum carvi L.</i>	Umbelliferae
2	الكسبره	Coriander	<i>Coriandrum sativum L.</i>	
3	الشبت	Dill	<i>Anethum graveolens L.</i>	
4	خلة شيطاني	Khella	<i>Ammi majus L.</i>	
5	خلة بلدي	Visnaga	<i>Ammi visnaga L.</i>	

RESULTS AND DISCUSSION

Seventy-seven species and four varieties belonging to thirty-seven genera of phyllosphere and phylloplane fungi were collected and identified in this study (Tables 2-4). Most of these fungi have been previously isolated in our laboratory from other different herbs, spices and medicinal plants (1, 3).

Phyllosphere fungi

The average total counts of phyllosphere fungi of each five herbs tested of the families Labiatae, Solanaceae and Umbelliferae ranged widely from 2040-16660, 1080-10720 and 240-5400 colonies/g fresh weight of leaves on GCA; and from 1840-11720, 1320-8080 and 800-4800 colonies/g on DCPA, respectively. The highest average counts in the total population of phyllosphere fungi were recorded from peppermint on GCA (16660 colonies) and thyme on DCPA (11720 colonies) and from aubergine and red pepper on GCA (10720 colonies of each). While the lowest average counts were obtained from dill (240 colonies on GCA and 800 on DCPA media), nightshade on GCA (1080 colonies) and henbane on DCPA (1320 colonies), (Tables 5-7).

These results are similar to those reported by many workers. El-Kady *et al.* (1) surveyed the mycoflora of 24 kinds of spices and reported that the average total fungal counts fluctuated between 425.6 and 2752.8 colonies/g of spice. They also reported that the highest fungal count was recorded from red pepper while the lowest for nutmeg. Youssef (3) determined the fungal flora of 55 kinds of herbal medicinal plants and found that the average total fungal counts ranged from 181 to 37955 colonies/g dry weight. He observed that the highest fungal count was obtained from colocynth and the lowest from galangal. The average fungal counts from datura (thornapple), henbane, peppermint, thyme and visnaga were 4526, 3152, 1992, 8967 and 1036 colonies/g dry weight, respectively.

The highest number of phyllosphere-fungal genera and species were recorded from Solanaceous plant (24 genera & 50 species 2 varieties) on both media (Tables 2-4). The highest numbers of fungal genera and species were determined in henbane (Solanaceae) (14 genera & 23

species) and basil leaves (Labiatae) (12 genera & 19 species + two varieties) on GCA (Tables 5, 6). Eman Mostafa (11) isolated 8 fungal genera and 16 species from red pepper (Solanaceae), 14 genera and 23 species from thyme (Labiatae) and 14 genera and 30 species from coriander (Umbelliferae). Youssef (3) identified 9 genera, 33 species and 4 varieties in datura (Solanaceae), 20, 54 & 2 in thyme (Labiatae) and 6, 32 & 1 in visnaga (Umbelliferae).

Cladosporium, *Aspergillus* and *Alternaria* were the most common genera of phyllosphere fungi isolated in this study. *Cladosporium* contributed 52.4% & 63.4%, 80.8% & 80.9% and 39.7% & 42.3% of the gross total fungal counts estimated in the Labiatae, Solanaceae and Umbelliferae on GCA & DCPA media, respectively. *Aspergillus* contributed 14.2% & 15.9%, 6.1% & 2.8% and 24.7% & 24.7%, while *Alternaria* contributed 14.5 & 10.1%, 3.2% & 6.5% and 10.6% & 15.9% of total fungi in Labiatae, Solanaceae and Umbelliferae on GCA & DCPA respectively as shown in Tables 2-4. These three genera were the most common phyllosphere fungi found on the leaf surface of other plants in Egypt (12-14). Mali *et al.* (15) isolated eight genera; *Alternaria*, *Aspergillus*, *Cladosporium*, *Colletotrichum*, *Curvularia*, *Drechslera*, *Macrophomina* and *Rhizopus*. from chili (*Capsicum annum*) Abdel-Gawad (16) reported that the most common genera of phyllosphere fungi isolated from khella (Umbelliferae), datura and chili (Solanaceae) and from peppermint, marjoram and rosemary (Labiatae) were *Aspergillus*, *Penicillium*, *Cladosporium*, *Alternaria* and *Drechslera*. Al-Hubaishi and Abdel-Kader (17) determined the phyllosphere and phylloplane fungi of qat in Sana'a, Yemen Arab Republic and found that *Cladosporium*, *Aspergillus* and *Alternaria* were the most common genera followed by *Penicillium*, *Drechslera*, *Fusarium*, *Curvularia*, *Phoma* and *Chaetomium*. El-Kady *et al.* (1) isolated *Aspergillus*, *Alternaria* and *Cladosporium* with high, moderate and low frequencies of occurrence, respectively, from 24 different kinds of spices.

Cladosporium cladosporioides, *Aspergillus flavus*, *A. fumigatus*, *A. niger* and *Alternaria alternata* were the most prevalent species in our study (Tables 2-4). The above species have been isolated, but with different incidences,

from the leaf surface of several plants in Egypt and in many parts of the world (12,14,18-22).

Abdel-Gawad (16) found that *Aspergillus niger*, *A. fumigatus*, *Penicillium corylophilum*, *Cladosporium cladosporioides*, *C. herbarum*, *Alternaria alternata* and *Bipolaris spicifera* were the most common species of phyllosphere fungi on chili, datura, khella, marjoram, peppermint and rosemary. Sharma and Sharma (23) reported that the most common fungal species on four umbelliferous species (*Trachyspermum ammi*, *Daucus carota*, *Anethum sowa* and *Cuminum cyantum*) were *Aspergillus flavus*, *A. niger*, *A. fumigatus* and *Cladosporium herbarum*. Xiaoming *et al.* (24) isolated eight species of phyllosphere fungi from *Populus tomentosa* Carr. in China. They were *Alternaria alternata*, *Cladosporium cladosporioides*, *C. sphaeros-permum*, *C. oxysporum*, *Coniothyrium fuckelli*, *Humicola fuscoatra*, *Acremonium strictum* and *Aureobasidium pullulans*.

Penicillium was isolated from four species of Umbelliferae on both media, four species of Solanaceae on GCA, three species of Labiatae on DCPA and from two species of each of the Labiatae and Solanaceae herbs on both media (Tables 2-4). *Penicillium* species have been previously isolated as a common phyllosphere fungus from leaf surface of several plants in Egypt (12-14,16). Moharram *et al.* (26) isolated 13 species of *Penicillium* from anise and fennel seeds, while El-Kady *et al.* (1) and Youssef (3) found that *Penicillium* was commonly isolated from 24 kinds of spices and 55 different medicinal plants.

Fusarium was recovered with high and moderate incidence from members of the Labiatae and Solanaceae respectively on the two types of media used. On the other hand this genus was recorded with moderate or low incidence from umbiliferous plants. From the genus 4 species were recorded of which *F. oxysporum* and *F. solani* were prevalent on plants belonging to the Labiatae and Solanaceae. *F. equiseti* and *F. moniliforme* were less common on plants tested (Tables, 2-4). Abdel-Gawad (16) recorded that *F. oxysporum* was isolated with high occurrence from chili, datura (Solanaceae) marjoram, peppermint and rosemary (Labiatae). She also isolated *F. solani* from datura and peppermint leaves; *F. moniliforme*

from datura and *F. equiseti* from peppermint leaves. Al-Hubaishi and Abdel-Kader (17) isolated *Fusarium oxysporum* and *F. moniliforme* as phyllosphere fungi from qat in Sana'a, Yemen Arab Republic. Chaurasia (25) identified the mycoflora of three mustard varieties (PR-6, PR-10 and RW-175) and found that *F. oxysporum* and *F. solani* were common in all the three varieties. El-Kady *et al.* (1) isolated eight species and two varieties belonging to *Fusarium* from 24 kinds of spices in Egypt of which *F. oxysporum*, *F. moniliforme*, *F. equiseti* and *F. solani* were the most common species of this genus.

Emericella nidulans was recovered with high occurrence from Labiatae and Solanaceae while *Epicoccum nigrum* was species belonging to the recorded in high occurrence from Solanaceae species and moderately from species in the Labiatae and Umbelliferae on GCA (Tables 2-4). El-Kady *et al.* (1) and Youssef (3) have also been recorded this species with moderate and low frequencies of occurrence in 24 kinds of spices and 55 medicinal plants.

Curvularia was encountered with different incidence from plants tested. From the genus 2 species and 1 variety were collected : *C. clavata*, *C. lunata* and *C. lunata var. aeria* (Tables, 2-4). Mali *et al.* (15) isolated *Curvularia* from chili. Abdel-Gawad (16) found that *Curvularia* was common of phyllosphere fungi on the leaves surface of chili, datura, khella, marjoram, peppermint and rosemary plants. Also, Al-Hubaishi and Abdel-Kader (17) found that *Curvularia* has been the most frequent genera of phyllosphere and phylloplane of qat in Sana'a, Yemen. Several species of *Curvularia* have been isolated from spices and medicinal plants in Egypt (1, 3).

The remaining genera and species were isolated with low or rare frequencies from one or more of the three families on one or both of media (Tables 2-4).

Phylloplane fungi

The total counts of phylloplane fungi from each five different herbs of the Labiatae, Solanaceae and Umbelliferae fluctuated between 24-52, 44-134 and 11-88 colonies/15 Cm² of leaves segment on GCA; and between 29-35, 18-67 and 20-41 colonies on DCPA media, respectively. The best counts of phylloplane fungi were

recorded from red pepper on GCA (134 colonies) followed by khella on GCA (88 colonies) while the lowest count was in dill leaves on GCA (11 colonies) as recorded in Tables 5-7. There is similarities between this result and those obtained by several workers who isolated the phylloplane fungi from different plants. Abdel-Gawad (16) found that the gross total counts of phylloplane fungi on young leaves of chili, datura, khella, marjoram, peppermint and rosemary were 33.71, 22.31, 31.57, 29.34, 22.97 and 22.94 colonies/one square cm on GCA respectively. Abdel-Sater (14) reported that the total counts of glucophilic and cellulose-decomposing fungi in the phylloplane of wheat fluctuated between 89-222 and 135-214 colonies/50 leaves segment, respectively.

The number of genera and species of phylloplane fungi isolated from the three families in this study were lower than those of phyllosphere fungi. The largest numbers of phylloplane genera and species were recorded in members of the Labiatae (21 and 32 + 2 varieties) followed by the Solanaceae (18 genera and 32 species), and the Umbelliferae (13 and 28+1) on both media (Tables 2-4). The highest numbers of genera and species were recorded in aubergine (Solanaceae) (11 genera and 14 species), khella (Umbelliferae) (7 and 15 one variety) and peppermint leaves (Labiatae) (9 and 12) on GCA (Tables 5-7). Similar results were obtained by Adhikari (27) on the phylloplane mycoflora of three grasses of Pithoragarh from India. He isolated 65 species of fungi from *Thermeda anathera*, 58 from *Setaria glauca* and 56 from *Heteropogon contortus*; by Niwas et al. (28) who isolated 21 species of phylloplane fungi from leaves of *Cassia fistula* and *Thevetia neurifolia* and by El-Gindy (29) who isolated 25 species of phylloplane fungi from three species of peppermint (*Mentha viridis* L., *M. arvensis* De. and *M. piperita* L.).

Alternaria and *Aspergillus* were the most common genera of phylloplane fungi isolated from members of the three plant families on the two media. *Alternaria* was recovered from 50.0 & 20.8%, 28.3 & 21.7% and 33.0 & 21.6% while *Aspergillus* contributed 14.6 & 26.4%, 17.0 & 5.2% and 54.6 & 48.9% of total fungi isolated from members of the Labiatae, Solanaceae and Umbelliferae on GCA & DCPA, respectively. *Alternaria alternata*, *A. tenuissima*, *Aspergillus flavus*, *A. fumigatus* and *A. niger* were the most prevalent species (Tables 2-4). These fungi were found to be the most common phylloplane fungi present on the leaf surfaces of many other plants in Egypt (12-14, 16) as well as in other parts of the world (17, 30, 31).

Cladosporium was recovered from the five herbs tested of the family Solanaceae reaching 36.3 and 45.4% of the total fungi on GCA and DCPA media, respectively. It was also isolated from members of the other two families but with moderate occurrence. The most common species was *Cladosporium cladosporioids* (Tables 2-4). Other workers like Michiaki et al. (32) reported that *Cladosporium* was the most abundant genus isolated from leaf surface of orchard grass and ladino clover, Abdel-Gawad (16) reported that *Cladosporium cladosporioides* and *C. herbarum* were common phylloplane fungi on khella and marjoram leaves and Bansal et al. (31) isolated *Cladosporium* as a phylloplane fungi from *Capsicum annum*.

Penicillium was isolated from four members of the Solanaceae, three members of the Umbelliferae and two members of the Labiatae on GCA medium. This genus was less frequent on the other type of media used (Tables 2-4). *Penicillium* species have been previously isolated as phylloplane fungi from leaf surface' of some plants (12, 13, 16, 32). The remaining genera and species were isolated from one or two kinds of members of one, two, or the three families on one or both media with less frequent, as recorded in Tables 2-4.

Table (2) : Total counts (TC) of phyllosphere (colonies per g fresh leaves) and phylloplane (colonies per 15 cm² segments), % of total counts, number of cases of isolation (NCI, out of five plants) and occurrence remarks (OR) of fungal genera and species recovered from the different tested plants of family *Labiatae* on GCA and DCPA media at 28 ± 2 °C .

Genera and species	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR
<i>Acrophialophra fusispora</i>	0	0	-	0	0	-	1	0.52	1R	0	0	-
<i>Alternaria</i>	4696	14.47	5H	2240	10.12	5H	96	50.00	5H	33	20.76	4H
<i>A. alternata</i>	3336	10.28	5H	2200	9.94	5H	85	44.21	5H	15	9.43	4H
<i>A. citri</i>	0	0	-	0	0	-	2	1.04	1R	0	0	-
<i>A. tenuissima</i>	1360	4.04	5H	40	0.18	1R	9	4.69	4H	18	11.32	3M
<i>Aspergillus</i>	4600	14.17	5H	3520	15.90	5H	28	14.58	4H	42	26.42	5H
<i>A. alutaceus</i>	160	0.49	2L	280	1.26	2L	0	0	-	1	0.63	1R
<i>A. egyptiacus</i>	0	0	-	160	0.72	1R	0	0	-	2	1.26	2L
<i>A. flavus</i>	1560	4.81	5H	1840	0.31	5H	15	7.81	3M	19	11.95	4H
<i>A. flavus</i> var. <i>columnaris</i>	120	0.37	1R	0	0	-	2	1.04	1R	3	1.89	1R
<i>A. fumigatus</i>	360	1.11	3M	200	0.90	3M	4	2.08	2L	2	1.26	2L
<i>A. niger</i>	2160	6.66	5H	520	2.35	2L	7	3.65	4H	3	1.89	3M
<i>A. oryzae</i>	80	0.25	1R	0	0	-	0	0	-	0	0	-
<i>A. sydowii</i>	0	0	-	280	1.26	1R	0	0	-	0	0	-
<i>A. terreus</i>	40	0.12	1R	0	0	-	0	0	-	0	0	-
<i>A. ustus</i>	40	0.12	1R	120	0.54	2L	0	0	-	2	1.26	2L
<i>A. versicolor</i>	80	0.25	1R	120	0.54	1R	0	0	-	10	6.29	1R
<i>Bipolares</i>	680	2.10	1R	0	0	-	6	3.13	2L	0	0	-
<i>B. australiensis</i>	80	0.25	1R	0	0	-	1	0.52	1R	0	0	-
<i>B. spicifera</i>	600	1.85	1R	0	0	-	5	2.60	2L	0	0	-
<i>Circinella musca</i>	0	0	-	0	0	-	3	1.56	1R	0	0	-
<i>Cladosporium</i>	16996	52.37	4H	14040	63.40	4H	14	7.29	3M	41	25.79	2L
<i>C. cladosporioides</i>	12316	37.95	4H	13520	61.06	3M	13	6.77	3M	41	25.79	2L
<i>C. herbarum</i>	7040	21.69	3M	160	0.72	2L	0	0	-	0	0	-
<i>C. oxysporum</i>	280	0.86	1R	0	0	-	1	0.52	1R	0	0	-
<i>C. sphaerospermum</i>	360	1.11	1R	360	1.63	1R	0	0	-	0	0	-
<i>Curvularia</i>	200	2.22	2L	320	1.44	3M	3	1.56	1R	9	5.66	4H
<i>C. clavata</i>	120	0.37	1R	80	0.36	2L	1	0.52	1R	7	4.40	4H
<i>C. lunata</i>	80	0.25	2L	200	0.90	3M	0	0	-	1	0.63	1R
<i>C. lunata</i> var. <i>aeria</i>	0	0	-	40	0.18	1R	0	0	-	1	0.63	1R
<i>C. oryzae</i>	0	0	-	0	0	-	2	1.04	1R	0	0	-

Table (2) : Cont.

Genera and species	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR
<i>Emericella</i>	320	0.99	4H	40	0.18	1R	0	0	-	0	0	-
<i>E. nidulans</i>	280	0.86	4H	40	0.18	1R	0	0	-	0	0	-
<i>E. nidulans</i> var. <i>dentata</i>	40	0.12	1R	0	0	-	0	0	-	0	0	-
<i>Epicoccum nigrum</i>	320	0.99	3M	0	0	-	5	2.60	2L	0	0	-
<i>Exserohilum rostratum</i>	120	0.37	1R	40	0.18	1R	8	4.071	2L	1	0.63	1R
<i>Fusarium</i>	3120	10.23	4H	1784	8.06	5H	21	10.94	4H	26	16.35	4H
<i>F. equiseti</i>	240	0.74	2L	40	0.18	1R	8	4.17	2L	6	3.77	2L
<i>F. moniliforme</i>	0	0	-	80	0.36	1R	2	1.04	1R	0	0	-
<i>F. oxysporum</i>	1800	5.55	4H	1184	5.35	2L	10	5.21	4H	18	11.32	4H
<i>F. solani</i>	1280	3.94	3M	480	2.168	4H	1	0.52	1R	2	1.26	1R
<i>Paecilomyces variotii</i>	120	0.37	1R	0	0	-	0	0	-	0	0	-
<i>Penicillium</i>	600	1.85	2L	160	0.72	3M	3	1.56	2L	7	4.40	2L
<i>P. aurantiogriseum</i>	80	0.25	2L	0	0	-	0	0	-	1	0.63	1R
<i>P. citrinum</i>	40	0.12	1R	0	0	-	2	1.04	1R	1	0.63	1R
<i>P. corylophilum</i>	200	0.62	1R	160	0.72	3M	1	0.52	1R	1	0.63	1R
<i>P. funiculosum</i>	80	0.25	1R	0	0	-	0	0	-	2	1.26	2L
<i>P. islandicum</i>	80	0.25	1R	0	0	-	0	0	-	2	1.26	2L
<i>P. purpurogenum</i>	40	0.12	1R	0	0	-	0	0	-	1	0.63	1R
<i>P. rugulosum</i>	80	0.25	1R	0	0	-	0	0	-	0	0	-
<i>Phoma glomerata</i>	360	1.11	1R	0	0	-	0	0	-	0	0	-
<i>Pleospora herbarum</i>	40	0.12	1R	0	0	-	2	1.04	1R	0	0	-
<i>Rhizopus stolonifer</i>	40	0.12	1R	0	0	-	0	0	-	0	0	-
<i>Trichothecium roseum</i>	40	0.12	1R	0	0	-	0	0	-	0	0	-
<i>Verticellium terrestre</i>	0	0	-	0	0	-	1	0.52	1R	0	0	-
<i>Mycelia sterilia</i>	0	0	-	0	0	-	1	0.52	1R	0	0	-
Gross total count	32452			22144			192			159		
Number of genera	15			8			13			7		
Number of species + variety	36+2			22+1			24+1			21+2		

* OR = Occurrence remarks
H = high occurrence, 4 or 5 cases (out of 5) M = moderate occurrence, 3 cases
L = low occurrence, 2 cases R = rare occurrence, 1 case

Table (3) : Total counts (TC) of phyllosphere (colonies per g fresh leaves) and phylloplane (colonies per 15 cm² segments), % of total counts, number of cases of isolation (NCI, out of five plants) and occurrence remarks (OR) of fungal genera and species recovered from the different tested plants of family *Solanaceae* on GCA and DCFA media at 28 ± 2 °C.

Genera and species	Phyllosphere						Phylloplane					
	GCA			DCFA			GCA			DCFA		
	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR
<i>Acremonium implicatum</i>	0	0	-	40	0.23	1R	0	0	-	0	0	-
<i>Alternaria</i>	1120	3.16	5II	1120	6.47	5II	113	28.25	5II	42	21.76	5H
<i>A. alternata</i>	840	2.37	5II	960	5.53	5II	67	16.75	5II	41	21.24	5II
<i>A. chlamyospora</i>	0	0	-	80	0.46	1R	0	0	-	0	0	-
<i>A. dianthi</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>A. macrospora</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>A. tenuissima</i>	200	0.57	2L	80	0.46	1R	46	11.50	4II	1	0.52	1R
<i>A. spargillus</i>	2160	6.10	5II	480	2.77	5II	68	17.00	5II	10	5.18	4H
<i>A. alutaceus</i>	120	0.34	1R	40	0.23	1R	2	0.50	2L	0	0	-
<i>A. egyptiacus</i>	0	0	-	80	0.46	2L	0	0	-	3	1.55	1R
<i>A. flavus</i>	520	1.47	4II	160	0.92	3M	36	9.75	3M	3	1.55	2L
<i>A. fumigatus</i>	520	1.47	4II	0	0	-	15	3.75	3M	0	0	-
<i>A. niger</i>	760	2.15	4II	160	0.92	2L	14	3.50	3M	1	0.52	1R
<i>A. oryzae</i>	0	0	-	0	0	-	1	0.25	1R	0	0	-
<i>A. terreus</i>	160	0.45	3M	40	0.23	1R	0	0	-	0	0	-
<i>A. terreus var. africanus</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>A. versicolor</i>	0	0	-	0	0	-	0	0	-	3	1.55	1R
<i>A. wentii</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Bipolaris</i>	40	0.11	1R	0	0	-	0	0	-	1	0.52	1R
<i>B. australiensis</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>B. spicifera</i>	0	0	-	0	0	-	0	0	-	1	0.52	1R
<i>Botrydiodia theobromae</i>	0	0	-	0	0	-	3	0.75	2L	0	0	-
<i>Botryotricum piluliferum</i>	0	0	-	0	0	-	1	0.25	1R	0	0	-
<i>Chaetomium</i>	440	1.24	1R	0	0	-	0	0	-	0	0	-
<i>C. globosum</i>	400	1.13	1R	0	0	-	0	0	-	0	0	-
<i>C. spirale</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Circinella muscae</i>	0	0	-	0	0	-	3	0.75	1R	0	0	-
<i>Cladosporium</i>	28600	80.79	5II	14040	80.88	5H	145	36.25	4II	88	45.60	5II
<i>C. cladosporioides</i>	20880	58.98	5II	12800	73.73	5H	144	36.00	4II	84	43.52	4H
<i>C. herbarum</i>	3280	9.27	3M	440	2.53	1R	0	0	-	0	0	-
<i>C. oxysporum</i>	4440	12.54	2L	80	0.46	1R	0	0	-	0	0	-
<i>C. sphaerospermum</i>	0	0	-	720	4.15	3M	1	0.25	1R	4	2.07	2L
<i>Curvularia</i>	80	0.22	1R	40	0.23	1R	10	2.5	3M	7	3.11	3M
<i>C. clavata</i>	40	0.11	1R	0	0	-	10	2.5	3M	6	3.11	3M
<i>C. lunata</i>	40	0.11	1R	40	0.23	1R	0	0	-	0	0	-
<i>C. ovoidea</i>	0	0	-	0	0	-	0	0	-	1	0.52	1R

Table (3) : Cont.

Genera and species	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR
<i>Emericella</i>	320	0.90	4II	0	0	-	1	0.25	1R	0	0	-
<i>E. nidulans</i>	240	0.68	4II	0	0	-	1	0.25	1R	0	0	-
<i>E. nidulans</i> var. <i>dentata</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>E. quadrilineata</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Epicoccum nigrum</i>	240	0.68	4II	40	0.23	1R	18	4.50	5II	2	1.04	2L
<i>Exserohilum rostratum</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Fusarium</i>	880	2.49	3M	1080	6.22	3M	18	4.50	2L	28	14.51	5II
<i>F. equiseti</i>	80	0.23	2L	40	0.23	1R	4	1.00	2L	0	0	-
<i>F. moniliforme</i>	160	0.45	1R	120	0.69	1R	0	0	-	2	1.04	1R
<i>F. oxysporum</i>	280	0.79	3M	720	4.15	3M	11	2.75	1R	25	12.95	5II
<i>F. solani</i>	360	1.02	3M	200	1.15	2L	3	0.75	2L	1	0.52	1R
<i>Helminthosphaeria clavariarum</i>	0	0	-	0	0	-	0	0	-	12	6.22	2L
<i>Mondictys castaneae</i>	0	0	-	40	0.23	1R	0	0	-	0	0	-
<i>Myrothecium verrucaria</i>	40	0.11	1R	0	0	-	1	0.25	1R	0	0	-
<i>Paecilomyces variotii</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Penicillium</i>	600	1.70	4II	160	0.92	2L	5	1.25	4II	0	0	-
<i>P. aurantiogriseum</i>	80	0.23	1R	0	0	-	0	0	-	0	0	-
<i>P. chrysogenum</i>	160	0.46	2L	40	0.23	1R	3	0.75	3M	0	0	-
<i>P. citrinum</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>P. corylophilum</i>	80	0.23	2L	40	0.23	1R	1	0.25	1R	0	0	-
<i>P. funiculosum</i>	160	0.46	2L	40	0.23	1R	1	0.25	1R	0	0	-
<i>P. islandicum</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>P. purpurogenum</i>	40	0.11	1R	40	0.23	1R	0	0	-	0	0	-
<i>Phoma glomerata</i>	120	0.34	1R	0	0	-	1	0.25	1R	0	0	-
<i>Pyrenophora avenae</i>	0	0	-	40	0.23	1R	0	0	-	0	0	-
<i>Rhizopus stolonifer</i>	0	0	-	40	0.23	1R	6	1.50	2L	0	0	-
<i>Scopulariopsis brumptii</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Scytalidium lignicola</i>	0	0	-	0	0	-	1	0.25	1R	0	0	-
<i>Stachybotrys chartarum</i>	200	0.57	3M	0	0	-	0	0	-	0	0	-
<i>Torula graminis</i>	0	0	-	80	0.46	1R	0	0	-	0	0	-
<i>Torula graminis</i>	40	0.11	1R	0	0	-	0	0	-	0	0	-
<i>Trichoderma viride</i>	80	0.23	2L	0	0	-	1	0.25	1R	0	0	-
<i>Trichothecium roseum</i>	0	0	-	80	0.46	1R	0	0	-	0	0	-
<i>Ulocladium</i>	0	0	-	40	0.23	1R	0	0	-	0	0	-
<i>U. atrum</i>	0	0	-	40	0.23	1R	0	0	-	0	0	-
<i>U. microsporium</i>	320	0.91	4II	80	0.46	1R	2	0.5	2L	2	1.04	2L
<i>Mycelia sterilia</i>												
Gross total count	35400			17360			400			193		
Number of genera	18			13			16			8		
Number of species + variety	40+2			28			26			16		

* OR = Occurrence remarks

H = high occurrence, 4 or 5 cases (out of 5) M = moderate occurrence, 3 cases

L = low occurrence, 2 cases R = rare occurrence, 1 case

Table (4) : Total counts (TC) of phyllosphere (colonies per g fresh leaves) and phylloplane (colonies per 15 cm² segments). % of total counts, number of cases of isolation (NCI, out of five plants) and occurrence remarks (OR) of fungal genera and species recovered from the different tested plants of family *Umbelliferae* on GCA and DCPA media at 28 ± 2 °C.

Genera and species	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR
<i>Alternaria</i>	1080	10.57	4H	1440	15.86	4H	61	32.97	5H	30	21.58	5H
<i>A. alternata</i>	840	8.22	4H	1320	14.54	4H	51	27.57	5H	20	14.39	5H
<i>A. citri</i>	0	0	-	40	0.44	1R	1	0.54	1R	3	2.16	1R
<i>A. tenuissima</i>	240	2.35	1R	80	0.88	1R	9	4.87	4H	7	5.04	2L
<i>A. spergillus</i>	2520	24.66	5H	2240	24.67	5H	101	54.60	5H	68	48.92	5H
<i>A. alutaceus</i>	120	1.17	3M	400	4.41	3M	3	1.62	3M	7	5.04	3M
<i>A. flavus</i>	680	6.65	5H	520	5.73	5H	8	4.32	3M	13	9.35	5H
<i>A. flavus</i> var. <i>columaris</i>	200	1.96	3M	200	2.20	2L	12	6.49	4H	8	5.76	1R
<i>A. fumigatus</i>	800	7.83	4H	840	9.25	3M	28	15.14	5H	34	24.46	3M
<i>A. niger</i>	480	4.70	3M	240	2.64	2L	6	3.24	2L	6	4.32	2L
<i>A. oryzae</i>	40	0.39	1R	0	0	-	0	0	-	0	0	-
<i>A. tamarii</i>	0	0	-	0	0	-	1	0.54	1R	0	0	-
<i>A. terreus</i>	120	1.17	2L	40	0.44	1R	41	22.16	2L	0	0	-
<i>A. versicolor</i>	80	0.78	1R	0	0	-	2	1.08	1R	0	0	-
<i>Biplaris lunata</i>	0	0	-	0	0	-	0	0	-	2	1.44	2L
<i>Bispora betulina</i>	80	0.78	1R	0	0	-	0	0	-	0	0	-
<i>Botryticum piluliferum</i>	0	0	-	0	0	-	0	0	-	1	0.72	1R
<i>Circinella muscae</i>	120	1.17	2L	0	0	-	0	0	-	0	0	-
<i>Cladosporium</i>	4060	39.73	4H	3840	42.29	4H	2	1.08	1R	9	6.48	3M
<i>C. cladosporioides</i>	2220	21.72	4H	3720	40.97	4H	2	1.08	1R	9	6.48	3M
<i>C. herbarum</i>	40	0.39	1R	80	0.88	1R	0	0	-	0	0	-
<i>C. oxysporum</i>	1800	17.61	1R	40	0.44	1R	0	0	-	0	0	-
<i>Curvularia clavata</i>	40	0.39	1R	200	2.20	4H	2	1.08	2L	3	2.16	3M
<i>Emericella nidulans</i>	200	1.96	2L	360	3.97	2L	3	1.62	3M	4	2.88	1R
<i>Epicoccum nigrum</i>	120	1.17	3M	80	0.88	2L	1	0.54	1R	2	1.44	2L
<i>Exserhillum rostratum</i>	40	0.39	1R	0	0	-	0	0	-	0	0	-
<i>Fusarium</i>	840	9.22	3M	280	3.08	2L	2	1.62	1R	17	12.23	1R
<i>F. equiseti</i>	160	1.57	3M	80	0.88	2L	0	0	-	0	0	-
<i>F. moniliforme</i>	0	0	-	80	0.88	2L	0	0	-	0	0	-
<i>F. oxysporum</i>	680	6.65	2L	80	0.88	2L	2	1.08	1R	17	12.23	1R
<i>F. solani</i>	0	0	-	40	0.44	1R	0	0	-	0	0	-

Table (4) : Cont.

Genera and species	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR	TC	%TC	NCI & OR
<i>Ilmicla grisea</i>	0	0	-	40	0.44	1R	0	0	0	0	0	-
<i>Memnoniella echinata</i>	0	0	-	40	0.44	1R	0	0	0	0	0	-
<i>Mucor hiemalis</i>	40	0.39	1R	0	0	-	0	0	0	0	0	-
<i>Myrothecium verrucaria</i>	0	0	-	0	0	-	1	0.54	1R	0	0	-
<i>Neurospora crassa</i>	0	0	-	0	0	-	1	0.54	1R	0	0	-
<i>Penicillium</i>	560	5.48	4H	440	4.85	4H	10	5.46	3M	3	2.16	2L
<i>P. aurantiogriseum</i>	0	0	-	0	0	-	2	0.54	2L	0	0	-
<i>P. chrysogenum</i>	160	1.57	4H	160	1.76	4H	1	0.54	1R	2	1.44	2L
<i>P. citrinum</i>	80	0.78	2L	0	0	-	0	0	-	0	0	-
<i>P. corylophilum</i>	0	0	-	120	1.32	3M	1	0.54	1R	0	0	-
<i>P. funiculosum</i>	80	0.78	3M	0	0	-	2	1.08	2L	0	0	-
<i>P. islandicum</i>	120	1.17	2L	120	1.32	3M	0	0	-	1	0.72	1R
<i>P. janthinellum</i>	80	0.78	2L	0	0	-	2	1.08	2L	0	0	-
<i>P. purpurogenum</i>	40	0.39	1R	40	0.44	1L	2	1.08	2L	0	0	-
<i>Pyrenophora avenae</i>	40	0.39	1R	0	0	-	0	0	-	0	0	-
<i>Scopulariopsis brevicaulis</i>	80	0.78	2L	40	0.44	1R	0	0	-	0	0	-
<i>Scytalidium lignicola</i>	0	0	-	80	0.88	1R	0	0	-	0	0	-
<i>Stachybotrys chartarum</i>	320	3.13	2L	0	0	-	0	0	-	0	0	-
<i>Trichothecium roseum</i>	0	0	-	0	0	-	1	0.54	1R	0	0	-
<i>Mycellia sterilia</i>	80	0.78	2L	0	0	-	0	0	-	0	0	-
Gross total count	10220			9080			185			139		
Number of genera	15			12			11			10		
Number of species + variety	30+1			26+1			23+1			16+1		

* OR = Occurrence remarks

H = high occurrence, 4 or 5 cases (out of 5) M = moderate occurrence, 3 cases

L = low occurrence, 2 cases

R = rare occurrence, 1 case

Curvularia was isolated with high occurrence from members of Labiatae and with moderate occurrence from the Umbelliferae and the Solanaceae herbs on DCPA. Of the genus 4 species and one variety were collected of which *C. clavata* was the most common species (Tables 2-4). *Curvularia* has also been isolated from the leaf surfaces of some grasses in Japan and India by Michiaki *et al.* (32) and Bansal *et al.* (31)

Fusarium was frequently recovered from members of the Labiatae and the Solanaceae, but it was infrequently encountered from umbelliferous herbs. It was represented by 4 species of which *E. oxysporum* was the most prevalent. *F. equiseti*, *F. moniliforme* and *F. solani* were less common (Tables 2-4). *Fusarium* has been isolated previously from leaf surfaces of different plant grasses such as orchard grass (32); chili, datura, khella, marjoram, peppermint, rosemary (16); chili (31); *Heteropogon contortus*, *Themeda anathera* and *Setaria glauca* (27).

Epicoccum was isolated from all Solanaceous members on GCA. It has been isolated from some wild plants (*Acacia nilotica*, *Adhatoda vasica*, *Argemone mexicana*, *Datura stramonium*, *Ocimum basilicum* and *Ricinus communis*) by Saxena *et al* (33) in India, while Eman Mostafa (11) isolated it from caraway and coriander in Egypt.

Emericlla nidulans was recorded in three out the five herbs tested of the Umbelliferae members on GCA medium (Table 4). Varma *et al.* (34) have also isolated *E. nidulans* as a phylloplane fungus from chewing tobacco (*Nicotiana tabaccum*) leaves.

There are similarities between the fungi associated with the different herbs of the three plant families; there is no specific fungal flora characteristic for each of the families Labiatae, Solanaceae or Umbelliferae or any other herb of the three families, since the same mycoflora was recovered

also from other different herbs and spices in this and other laboratories; the highest numbers of fungal genera and species were recorded in the family Solanaceae (29 genera, 59 species and 2 varieties) followed by the Umbelliferae (23, 44 and one) and the species Labiatae (18, 44 and 3); *Fusarium oxysporum* was more dominant on Labiatae and Solanaceae species while *Penicillium* was common on members of the Solanaceae and the Umbelliferae. *Aspergillus alutaceus* was dominant on Umbelliferae members only while *Stachybotrus* was isolated with moderate occurrence only from members of the Labiatae and the Solanaceae. *Epicoccum nigrum* was dominant as a phyllosphere and phylloplane fungus on the Solanaceae and as a phyllosphere fungus only on the Labiatae and the Umbelliferae; *Curvularia* was dominant as a phyllosphere and a phylloplane genus on the Umbelliferae or the Labiatae and as a phylloplane fungus only on the Solanaceae; and some fungi such as *Acrophialophra fusispora*, *Aspergillus sydowii*, *A. ustus*, *Curvularia oryzae*, *Penicillium rugulosum* were isolated from the Labiatae only while other fungi such as *Alternaria chlamydospora*, *A. dianthi*, *Botrydiodia theobromae*, *Chaetomium globosum* and *Monodictys castaneae* were isolated from the Solanaceae only. Other fungi such as *Bispora betulina*, *Humicola grisea*, *Memnoniella echinata*, *Neurospora crassa* and *Penicillium janthinellum* were isolated only from the Umbelliferae (Tables 2-4).

The GCA medium was better than DCPA for isolation as the total counts of fungi were higher. It was not surprising to find that dematiaceous hyphomycetes and *Fusarium* species constituted the major part of the mycoflora isolated on DCPA (Tables 2-4). Previously, Andrews and Pitt (6) used this medium as a selective medium for the isolation of *Fusarium* species and dematiaceous hyphomycetes from cereals.

Table (5) : Average total counts (ATC) , number of genera (NG) and number of species + species varieties (NS+V) of fungi recovered from phyllosphere and phylloplane of the different tested plants of family *Labiatae* on the two types of media used .

Kinds of plants	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	ATC	NG	NS + V	ATC	NG	NS + V	ATC	NG	NS + V	ATC	NG	NS + V
Basil	6840	12	19+2	1840	6	11	47	6	7	30	6	14
Marjoram	3720	7	14	3104	7	9	31	8	12	35	5	7
Peppermint	16660	10	17	3160	7	7	52	9	12	31	8	12
Rosemary	2040	9	17	2320	9	15+1	38	6	9	29	4	8+2
Thyme	6192	5	7	11720	6	8	24	5	6+1	34	3	3

Table (6) : Average total counts (ATC) , number of genera (NG) and number of species + species varieties (NS+V) of fungi recovered from phyllosphere and phylloplane of the different tested plants of family *Solanaceae* on the two types of media used .

Kinds of plants	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	ATC	NG	NS + V	ATC	NG	NS + V	ATC	NG	NS + V	ATC	NG	NS + V
Aubergine	10720	12	19	8080	5	8	68	11	14	42	5	5
Datura	10520	11	18+2	2640	7	12	108	10	14	27	6	7
Henbane	2360	14	23	1320	6	8	44	9	10	18	4	4
Lycium	1080	5	6	1640	6	9	46	7	9	39	7	8
Red pepper	10720	8	14	3680	7	9	134	7	10	67	9	10

Table (7) : Average total counts (ATC) , number of genera (NG) and number of species + species varieties (NS+V) of fungi recovered from phyllosphere and phylloplane of the different tested plants of family *Umbelliferae* on the two types of media used .

Plant Meteril	Phyllosphere						Phylloplane					
	GCA			DCPA			GCA			DCPA		
	ATC	NG	NS + V	ATC	NG	NS + V	ATC	NG	NS + V	ATC	NG	NS + V
Craway	1540	10	15+1	1200	9	12+1	30	7	12+1	25	6	9+1
Criander	1320	8	13	1000	6	11+1	25	3	10+1	41	6	9
Dill	240	2	4+1	800	6	9	11	3	4	21	3	4
Khella	1720	9	15+1	1280	7	14	88	7	15+1	20	5	9
Visnaga	5400	9	18	4800	7	11	31	3	7	32	5	6

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