OBSERVATIONS ON THE SURVIVAL OF *Sphaerotheca fuliginea* AND RECURRENCE OF POWDERY MILDEW ON CUCURBITS IN LIBYA

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Abstract

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As in most countries, mode of survival and recurrence of powdery mildew of cucurbits caused by *Sphaerotheca fuliginea* which regularly appears on indoor and outdoor cucurbits in Libya are not known. Observations made in this context indicated that fungus survives in conidial stage throughout the year in the country. Differences in sowing times of cucurbits in indoor and outdoor cultivations ensures the availability of cucurbit hosts in the country all year-round. The pathogen seemingly survives by transfer of inoculum in conidial form from indoor to outdoor cucurbits in summer and vice-versa during winter.

Additional key words: powdery mildew *(Sphaerotheca fuliginea)*, cucurbits, Libya.

Introduction

Powdery mildew of cucurbits is world-wide in distribution and is found wherever cucurbits are grown (6). Both indoor and outdoor cultivations of cucurbits suffer variously from this disease (12). The seriousness of the disease is more in glasshouses than in the field because of favourable environmental conditions such as moderate to high temperature, high soil moisture, reduced air circulation, reduced light intensity and continuous cropping (3, 12). *Sphaerotheca fuliginea* (Schlecht.) Poll., *Erysiphe cichoracearum* Dc. and *Leveillula taurica* (Lev.) Arnaud are established pathogens of the disease (9). *S. fuliginea* is more widely distributed and is chiefly responsible for the disease (9). The mode of overwintering or oversummering of cucurbit powdery mildew fungi is not yet well known in many parts of the world and the recurrence of the disease is a perplexing problem. The knowledge about the mode of survival of the fungus and the perpetuation of the disease which is a very important aspect of the problem is incomplete.

In Libya, a number of cucurbits are grown as indoor crops (in plastic tunnels and glasshouses) and as outdoor crops (in field plots). As indoor crops cucurbits are grown almost throughout the year especially in glasshouses. For outdoor crops, sowing begins in March and crops normally and by November. In desert region, Cucurbits are grown only as outdoor crops from March to October. Both indoor and outdoor crops suffer because of powdery mildew disease recurring every year. The mode survival of the pathogen, *S. fuliginea,* chiefly responsible for the disease, and recurrence of the disease have not been worked out in the country. Therefore, we made an attempt to understand its mode of survival and recurrence on cucurbits in Libyan conditions.

Materials and Methods

The observations were made during a survey conducted all year round starting from early April of 1981 to March 1982 in coastal belt (localities in El-Marj, Benghazi, El-Khoms, Tripoli) and from June to October of 1981 in the desert (localities in Kufra, Jalo, Aujela) areas of Libya. Cucurbits (cucumber, squash, pumpkin, bottlegourd, cantaloupe and watermelon) grown in outdoor field plots, glasshouses and plastic tunnels were visually observed thoroughly for apparent presence of the powdery mildew. In each area, 5 - 10 cultivation units (field plots, glasshouses, plastic tunnels) depending upon their availability were included in the observations. Samples from the infected plants were collected from different areas for laboratory examination and pathogen identification. During the course of observation, for the mode of survival and recurrence of the disease in the country, attention was given to the volunteer and a few cultivated cucurbits in outdoor fields during winter (December - January) when temperature is supposedly not congenial for cucurbit growth. Such cucurbits were regularly observed for the presence of powdery mildew especially in Tripoli in the Western coast and Benghazi and El-Marj in the Eastern coast. Winter cucurbits grown indoor were also periodically examined in these areas for the occurrence of powedry mildew throughout their cropping season.

Results and Discussion

At El-Marj in the Eastern coast the disease was found on indoor cucurbits as early as November whereas in other areas of the coastal belt it was observed in December - January. Infection continued till the end of the crops. On outdoor cucurbits disease appeared during April - May throughout the coastal belt and infections could be observed even

beyond November. In the desert (Kufra, Jalo and Aujela) disease appeared in July and August and remained till September - October. Among the volunteer cucurbits a few plants of bottlegourd, *Lagenaria leucantha* climbing on olive tree and other supports were observed to maintain the powdery mildew *(S. fuliginea)* during November - February at the Agriculture Farm of the Faculty of Agriculture and Sooq El-Juma in Tripoli. Outdoor plots of *Cucurbita pepo* grown in late summer was also found maintaining heavy inoculum of *S. fuliginea* in the following winter till early January at Tripoli and Benghazi.

The powdery mildew was found to thrive on indoor cucurbits during winter (November - March) when outdoor crops were unavailable. As the disease on outdoor crops appeared in April - May, transfer of powdery mildew inoculum to outdoor cucurbits from indoor can be speculated. Similarly, the presence of powdery mildew on outdoor cucurbits even beyond November, transfer of inoculum from these crops to indoor cucurbits in November is also likely. Furthermore, the role of volunteer cucurbits observed maintaining powdery mildew during winter can be envisaged in the recurrence of the disease.

Various possibilities have been suggested for survival of powdery mildews of cucurbits. On cucurbits, perithecia of *S. fuliginea* and *E. cichoracearum* are known to be formed though not regularly in several countries (9), but whether these ascocarps play any role in the overwintering or oversummering survival behaviour, is not yet established. The possibility of overwintering or oversummering action as mycelium within the buds in case of *S. fuliginea* is excluded because most of the cultivated cucurbits on which the disease regularly appears are annuals. Jagger (7) speculated that as perithecial production by *E. cichoracearum* on cucumber is rare the fungus may be able to persist in the vegetative form. Yarwood (14) pointed out that in U.S.A. most acceptable manner of overwintering in the conidial state in Southern region which is warm and blow north to each season. Rudenko (11), however, believed that both *S. fuliginea* and *E. cichoracearum* overwinter as perithecia and they appear annually. In Australia, Alcorn (2) claimed that seven non-cucurbitaceous alternative hosts of the powdery mildew of cucurbits possibly play some role in perpetuation. Ballantyne (3), however, ruled out this possibility for Australia as these alternative hosts do not survive winter conditions. In England, Stone (13) found that several common weeds were susceptible to experimental infection by *E. cichoracearum* and *Sonchus asper* and very probably they can be sources of reinfection for cucurbits. There are suggestions that in tropics as well as in the areas where the winter is not very severe, the powdery mildews can overwinter as active mycelium in shattered situations, on a variety of volunteer and cultivated cucurbits (1, 4, 8, 10).

In Libya, cucurbit cultivation both indoor and outdoor at different timings ensures the availability of the hosts for such obligate parasite throughout the year. It seems very much likely that *S. fuliginea* survives throughout the year in the condial stage in the country. Perithecia of *S. fuliginea* in Libya are very rare (5) and their functional role in perpetuation and recurrence of the disease is doubtful. *S. fuliginea* in winter (2 - 11°C) survives on indoor cucurbits grown under temperature (25 - 30°C) and relative humidity (80 - 90%) conditions congenial for the pathogen as well. When cucurbits become available outdoors in summer with temperature suitable for *S. fuliginea*, infection occurs. The pathogen may survive on outdoor cucurbits till early winter, especially on late summer crops, after which the pathogen infects indoor cucurbits available by that time. Additionally, self-grown or volunteer cucurbits under the shades of trees or other protected places maintaining powdery mildew even during early winter may play contributory role in the maintenance of inoculum and recurrence of the disease.

In view of annual recurrence of the disease on both indoor and outdoor crops, rare production of ascocarp and absence of any experimental evidence of functional role of ascospores, difference in sowing time of indoor and outdoor cucurbits in ensuring the year-round availability of cucurbits in the country, transfer of inoculum from indoor to outdoor cucurbits in summer and vice-versa during winter seems to be the logical method of perpetuation of the fungus and recurrence of the disease in Libya. Such a possibility can be expected in other countries as well with similar climatic conditions and practices of cucurbit cultivation. This needs to be further investigated in Libya and in other similar countries as well.

الملخص

العماري، س. س. و م. و. خان. 1987. مشاهدات حول قدرة بقاء الفطر *Sphaerotheca fuliginea* وعودة الإصابة بمرض البياض الدقيقي على القرعيات في ليبيا. مجلة وقاية النبات العربية 5: 88 - 86.

لا تـزال طريقـة بقاء الفـطر *Sphaerotheca fuliginea* وعـودة الإصـابة بمـرض البياض الـدقيقي المتسبب عنه على نبـاتات القـرعيات المـزروعة في الحقـل وضمن البيوت البـلاستيكيـة مجهـولـة في ليبيـا كمـا هي الحـال في معـظم البلدان. دلت المشـاهدات في ليبيـا أن الفطر المسبب للمـرض يبقى طـوال العام في طور الكونيديا (Condial stage). كما أن الاختلاف في أوقات زراعة القرعيات في البيوت البلاستيكية وفي الحقل يؤمن وجود عائل للفطر على مدار السنة. ويبـدو أن مسبب المرض يحافظ على استمراريته بواسطة نقل العدوى في طور الكونيديا من البيـوت البـلاستيكيـة إلى الحقـل في فصـل الصيف ومن الحقل إلى البيوت البلاستيكية في فصل الشتاء.

كلمات مفتاحيـة: البياض الـدقيقي (**سفيروثيكـا فيوليجينـا**)، قرعيات، ليبيا.

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