

INTRODUCTION

1. INTRODUCTION

Common flax (*Linum usitatissimum* L.) is the only member of a genus (containing 200 or more species) that is cultivated commercially as a field crop. There are approximately 3000 entries from this species in the US germplasm collection maintained by the US Department of Agriculture. It is known that flax has been cultivated in ancient Egypt at the time of Pharaohs and perhaps even by prehistoric man. The name "usitatissimum", meaning "most useful", is appropriate since both stems and seeds long have been used for economic products (Dybing and Lay, 1981).

Economically, important tissues of flax include fibers of the stem and oil-containing tissues of the seed. Fibers obtained from stems for use in linen cloth and paper consist of strands of elongated, thick-walled sclerenchyma cells from the phloem regions of vascular bundles. Such fiber strands attain lengths over 90 cm. Individual fiber cells grow in length at both apices and increase in wall thickness by deposition of secondary wall layers. They extend from the base of the stem into panicle branches, but the latter do not contribute fiber of commercial value. In the seed, both endosperm and embryo are oil-storing tissues. The embryo occupies the central cavity of the seed and is the major tissue both in size and oil content. Oil content of the embryo may be as high as 60 to 70% of the tissue dry weight. Linolenic acid comprises 40 to 60% of the total fatty acids of the two tissues. Others include palmitic and stearic acids (less than 10% each), oleic acid (15 to 30%), and linoleic acid (10 to 20%) (Dybing and Lay, 1981).

Flax production in Egypt is mainly concentrated in the northern and middle governorates of the Nile Delta. The Egyptian cultivars are dual purpose produce both fibers and seeds.

During the last five years, there has been a steady fluctuation in flax exports accompanied by comparable fluctuation in imports. This has ultimately diminished flax-producing areas (Tables A and C). The inconsistency in flax exports is attributed to the deterioration of fiber quality due to disease, in particular, powdery mildew (Khalil *et al.*, 1987). This disease currently is considered the most common, conspicuous, widespread, and easily recognized foliar disease of flax. The warm weather in Egypt, during the late period of growing season, favors epiphytotic spread of the disease. Since the disease is a relatively new in Egypt, disease control by selection of disease resistant cultivars has not been emphasized in the development of commercial flax cultivars. Thus, all commercial cultivars are highly susceptible.

Table A. Flax areas and production (straw and seed) from 1990 to 1994 in A.R.E.

Year	Flax area feddan*	Straw		Seed			
		Mean values ton/fed	Total production ton	Mean values ardab/fed	Mean values kg/fed	Total production ardab	Total production ton
1990	30725	2.790	85889	4.42	539.24	135853	16574.066
1991	43584	2.734	119176	4.15	506.30	180896	22069.312
1992	29472	2.744	80869	4.43	540.46	130653	15939.666
1993	28922	2.943	85109	5.06	617.32	146217	17838.474
1994	28419	3.033	86184	4.80	585.60	136407	16641.654

* Feddan = 4200 m² and ardab = 122 kg.

Table B. Exports of flax products from 1990/1991 to 1993/1994.

Variety		1990/1991	1991/1992	1992/1993	1993/1994
Raw fiber	Quantity *	660800	54000	376300	446405
	Price	345897	46836	237825	1200221
Retted flax	Quantity	-	144000	-	-
	Price	-	89108	-	-
Unspun comb flax	Quantity	4691415	3377787	4653344	4980076
	Price	11730467	11492715	12187672	16151566
Flax remainders	Quantity	3656936	1983158	3564342	2834616
	Price	2728155	2380280	3274362	6829961
Broken flax	Quantity	-	-	-	1174768
	Price	-	-	-	5997394

* Quantity in kg and price in Egyptian pounds.

Table C. Imports of flax products from 1990/1991 to 1993/1994.

Variety		1990/1991	1991/1992	1992/1993	1993/1994
Raw fiber	Quantity *	-	21000	64352	16140
	Price	-	38262	196576	135698
Retted flax	Quantity	200	-	-	-
	Price	1572	-	-	-
Unspun comb flax	Quantity	6872	536000	480770	397428
	Price	265407	408381	1490724	2235081
Flax remainders	Quantity	-	-	61750	-
	Price	-	-	193129	-

* Quantity in kg and price in Egyptian pounds.

Sources of statistics: Miscellaneous Reports on Flax Production, Exports, and Imports. Agricultural Economic Research Institute (in Arabic).

Since disease has been subjected to limited studies under Egyptian conditions. Then, the present study was initiated to study the following aspects of the disease:

1. Survey of the disease in commercial fields.
2. Pathogenesis of the causal fungus *Oidium lini* of flax.
3. Identification of teleomorph of *O. lini* by:

- a). Characterization of morphological traits of *O. lini* compared to those of *Erysiphe cichoracearum* and *E. polygoni*.
- b). Characterization of biochemical traits of *O. lini* compared to those of *E. cichoracearum* and *E. polygoni*.

The biochemical traits included:

- 1). Serological protein patterns.
 - 2). Electrophoretic protein patterns.
4. Effect of relative humidity and temperature on spore germination and length of germ tubes.
 5. Effect of flax cultivar and sampling date on susceptibility of flax to morphotype 1 of *O. lini*.
 6. Chemical control of the disease by foliar application of some compounds under field conditions. These compounds includes:
 - a). Fungicides.
 - b). Bicarbonate salts and film-forming polymers.
 7. Effect of sowing date on susceptibility of flax to powdery mildew.
 8. Reaction of flax genotypes to powdery mildew.
 - a). Field evaluation.
 - b). Greenhouse evaluation.
 9. Relationships of the disease to physical and chemical edaphic factors.
 10. Effects of different levels of seed rates, nitrogen fertilization, and phosphorus fertilization on intensity of the disease under field conditions.

Biometrical and biochemical approaches were used to study the previously mentioned aspects of the disease.