INSECT PESTS OF SUNFLOWER IN THE SUDAN

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ABSTRACT

Research on Sunflower in the Sudan dates back to more than sixty years, but only during the last decade has its commercial growing attracted investors. The expanded use of the crop, and the consequent increase in production, occurred when the production of traditional oil crops, e.g. sesame, groundnut and cotton seed, has sharply declined. Sunflower is mainly produced for the extraction of edible oil, although the meal forms a high-protein source and is blended in animal feed. The crop is grown under rain in summer and under irrigation in winter. In both agroecosystems the plant is associated with a wide range of insect species, some of which are highly injurious pests. *Helicoverpa armigera* is a regular and very serious pest, its larvae feed voraciously on leaves of young plants, and during the reproductive phase they attack the inflorescene and developing seeds. *Apophylia saliens* may cause substantial damage if large numbers of adult beetles attack the seedlings. The crop also harbours other pest species which occassionally reach damaging levels. The entomology of sunflower is still not fully worked, and research for development of an effective pest management strategy requires a lot of concerted efforts to be put on good footing.

Key-words: *Helicoverpa armigera*, chemical control, cultural manipulation, predators, parasitoids, pollinators.

INTRODUCTION

Wild sunflower has long been known in the Sudan, and the heliotropism of the young flower head has involved the plant in a legend from which it gained its vernacular name ABBADESHAMS (worshiper of the sun). However, the commercially grown cultivars were first introduced into the country for experimental purposes during the 1930s, and various agronomic aspects of the crop have been intermittently studied since then, the drive being mainly a personal interest of investigators.

Only in the 1980s has the large scale commercial growing of sunflower attracted attention, and the acrage allocated to it is rapidly increasing. The crop is mainly produced for the extraction of edible oil, although its meal forms a high-protein source and is blended in animal feed. The expanded use of sunflower, and the consequent increase in production, occurred when the traditional oilseed crops, mainly sesame and groundnuts, have been hard-hit by the droughts of the 1980s. Another oil crop, cotton seed, which is a by-product of a crop grown for other purposes, has also suffered sharp cuts due to processing and marketing problems facing lint.

Sunflower is grown as rainfed crop in summer and under irrigation in winter (Ishag,1988). In both agroecosystems the plant is associated with a wide range of insect species, most of which are only known by name, with little or no reliable information about their impact on the crop. In this paper we appraise the current status of the entomology of sunflower and emphasize the need for an ecological approach to pest management to replace the fragemented programmes which focus on pest species as problems in single crops.

PEST PROBLEMS:

From planting to seed maturity the sunflower plant harbours a wide range of insect species, including both noxious and beneficial groups. Among the former category the bollworm *Helicoverpa armigera* stands out as the most important and most destructive pest of sunflower. It is more abundant on the summer than on the winter crop. This is natural since most of the cultivated and wild hosts of the pest grow during the rainy season, which extends from May to October. The early influx of moths invade the natural vegetation, but when the commercial crops, including sunflower, are established, egg-laying is diverted to these. Sunflower may sustain more than one generation of *H. armigera*. During the vegetative stage the larvae feed on the leaves. After flowering the inflorescence and the developing seeds become the main feeding site. The polyphagy of the pest and the complex plant community surrounding sunflower, consisting of a succession of cultivated and uncultivated hosts, favour the perpetuation of *H. armigera* on this crop: many plants are preferentially available as larval food during specific developmental stages, while others are attractive during both vegetative and reproductive phases. This often guarantees temporal and spatial availability of food for a succession of generations and increases the chances of repeated invasions of crops like sunflower.

The damage inflicted by *H. armigera* varies in nature and magnitude with the stage of plant growth. Early attack may result in complete destruction of the young plants, but if the attack occurs after the initiation of seed filling the crop can tolerate a relatively high level of infestation without the yield being substantially affected. The larvae may be highly injurious if they bore into the peduncle of the flower head, but this kind of attack is rather rare. The damage inflicted by another heliothine larva *Heliothis peltigera* is similar in nature to that caused by the preceding species. However,the latter insect never occurs in numbers which can cause worry. *Spodoptera exigua* and *S.*

littoralis are early season leaf feeders, but they rarely attain damaging levels. The blister beetle *Epicauta aethiops* is also an early season defoliator. The flea beetle *Apophylia saliens* devastates whole plantations when large numbers of adults attack the seedlings. Another flea beetle *Aphthona latipennis* is often encountered on leaves and flower heads. *Alcidodes haemopterus and Microlarinus humeralis* feed on the inflorescene. However, the most conspicuous species that attack the flower heads are the Cetoniidae *Pachnoda interrupta, P. marginata, Rhadotis sobrina* and *Protaetia stolata*. It is the tendency of these beetles to cluster on flower heads that makes them noticeable. They principally feed on anthers but the soft seeds are also consumed and the occupants of a flower head usually stay on it until they devour all its contents. *Nezara viridula, Agonoscelis pubescens, Piezoderus pallescens, Lygaeus mimus, L.pandurus, Anoplocnemis curvipes, Cyrtopeltis tenuis and Galeatus scrophicus* are taken on sunflower, but many of these bugs occur on almost every plant. Of the genus *Nysius*, which includes highly destructive pests of sunflower in other parts of the world (Weiss, 1983), there is only a single record of an unidentified species from sunflower in the Sudan. *Bemisia tabaci* and *Jacobiasca lybica* are considered minor pests of sunflower. Thrips may pose real threat to the young crop under conditions of severe water stress. Grasshoppers and locusts are unpredictable pests and crop growers fear them more than anything else. Early season infestation by termites results in gappy, poor crop stand, while late season attack aggravates the problems of lodging. Damage due to bird attack, especially doves, is a major cause of seed loss.

PEST MANAGEMENT

Entomological problems are among the main constraints limiting productivity of sunflower. Yet, this issue has never received the attention it deserves. Schmutterer (1969) enumerated the major insect pests of sunflower in the Sudan and Ali (1989) recommended some insecticides for controlling

H. armigera. These recommendations were based on empirical data relating to the effect of the chemicals on the pest. The level of infestation requiring control action and the economic profitability of spraying have not been considered. The low yields averaging less than 600 kg/ha and the soaring cost of insecticides, added to the health and environmental hazards involved in the use of highly toxic chemicals, make spraying unadvisable. Moreover, intervention by chemicals is most likely to be seen necessary when sunflower is in full bloom, a period of high activity of pollinators, mainly honey bees. It is common experience that the percentage of empty seeds resulting from failure of fertilization is much higher than yield loss attributable to the infestation of *H. armigera*. Even if these considerations are overlooked, confining spraying to sunflower alone does not benefit the crop. Imigrant pest populations from the surrounding habitats can subject sunflower to a continuous pressure of pest attack as long there is active breeding on those habitats.

Alternatives to chemicals can be developed, but this requires detailed knowledge of the natural regulatory forces determining diversity and population density. Insect abundance is affected by availability of food, suitability of climatic conditions and natural enemies. *H. armigera*, which is the most devastating pest of sunflower, breeds on more than a hundred cultivated and uncultivated plants, but cotton, sorghum, okra and sunflower are among its most favourite hosts. In the rainlands sunflower and cotton are grown in the midst of expansive areas of sprghum, and in mechanized schemes the two crops occupy adjacent fields. On the other hand, wild okra is a dominant weed, both within and outside the cultivated areas.

The challenge posd by this situation can partly be taclked by careful cultural manipulation: It is possible to avoid prolonged exposure to pest attack by the early sowing of short-season cultivars of uniform flowering. If resistance to insects and birds could be incorporated without sacrificing other desired characteristics, this would greatly improve the long-term prospects of

sunflower in the Sudan.

H. armigera is most abundant during the rainy season, but it continues to breed throughout the year. During the winter *H. armigera* breeds in irrigated sunflower, wheat, tomato, okra, faba bean, chickpea and fodder legumes. *H. armigera* is always associated with a high complex of parasitic and predaceous insects which attack all developmental stages. The scelionid wasp *Telenomus busseolae* parasitizes the eggs while the predaceous bugs *Campylomma nicolasi, Orius albidipennis* and *Geocoris* spp. suck the egg contents. Larval parasitoids include Bracon hebetor, B. *kirkpatricki, Meteorous laphygmarum chelonus versatilis, Euplectrus laphygmae, Pediobius furvus, Elasmus johnstoni, Palexorista laxa* and *Carcelia evolans. Eumenes maxillosus, Ammophila* spp. and *Polistes* spp. Collect prey larvae and take them to their nests for feeding their offspring.

Microbial agents, e.g. viruses, bacteria and fungi can contribute substantially to the check of *H. armigera*. It has been noticed that most of the larvae which feed on sorghum heads become morbid and fail to complete their development. If the microbes causing sickness are isolated and identified perhaps it would be possible to develop simple inexpensive techniques for propagation and mass application of these organisms.

Bilogical control may be more effective in irrigated agroecosystems, particularly during the mild winter climate, than in the temporaty habitats prevailent in rainlands. This implicates the need for placing more emphasis on plant characteristics when evaluating sunflower cultivars for production under rain.

SUMMARY

Sunflower has become an important source of edible oil in the Sudan.

The bulk of the crop is produced under rainfed conditions but it is being increasingly included as a winter crop in rotations in major irrigated schemes like Gezira and Rahad. All developmental stages of the crop are vulnerable to attack by a multitude of insect pests but *Helicoverpa armigera* is the most important and most destructive pest of sunflower, both during the vegetative and reproductive phases. The low productivity of the crop and the undesirable side effects of insecticides make chemical control economically unprofitable and environmentaly unadvisable. The solution of the entomological problems of sunflower seems to rest on the development of a broadly based management programme utilizing naturally occurring regulatory forces, plant characteristics and adjustment of cropping systems to spread the damage or to enable the crop to mature before the buildup of pests reaches damaging level.

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