Pest control in millet farming

How to control millet pests in the Sahel? Free supply of pesticides probably will come to an end, because of economic constraints and environmental problems. Sankung Sagnia outlines traditional pest control practices by Sahelian farmers and results of research. Together these represent a sound basis for IPM.

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In the Sahel, drought spells are a common occurrence. Agricultural activity is based on nomadic cattle raising and sedentary agriculture. The most common food crops grown -millet, sorghum and cowpeas- are those that possess some degree of adaptability to the prevailing climatic conditions. Besides recurrent droughts, insect pests and diseases constitute some of the most important factors limiting food production in the Sahel. Traditional farming systems hold the key to subsistence farming. The farms are often small with low utilization of inputs such as organic fertilizers. The price of such inputs is generally beyond the purchasing power of the ordinary farmer. As for pesticide use, most of this is provided free of charge in the event of pest infestation. With the current economic constraints however, a change in this benevolent practice is likely. This change will call not only for a limited reliance on pesticides but also for the adoption of cost-effective, environmentally safe methods of pest control, and especially the improvement of traditional pest control techniques. Many such techniques exist at farmer level. These methods often form part of the farmer's routine cultivation practices and thus require limited outside utilization of inputs.

Selection and storage

Seed selection and storage are important steps in millet and other cropping systems. Millet seeds destined for the next season's crop are selected by the farmer at harvest using criteria such as size and compactness of the millet head, seed size and appearance, absence of bird and insect damage and absence of diseases such as smut and ergoty. The essence of this practice is to produce vigorous seedlings that could fare well in the event of attack by pests or diseases. The period between the seed selection and actual planting is however very critical, since the selected seed is subjected to storage and thus vulnerable to attack by a variety of storage pests such as the lesser grain borer (Rhizopertha dominica), the khapra beetle (Trogoderma granarium) and larvae of storage moths. Some of these pests destroy the germination capacity of the seeds by feeding on the entire contents. Farmers use the following techniques to minimize damage to seeds in storage:

- hanging millet heads over kitchen fires to repel storage pests with the smoke;

- storing millet on the head in itself reduces damage by pests as opposed to storing it in the form of threshed grains because the glumes on the in-threshed head act as protective devices;

- mixing seeds with inert substances such as sand and wood ash. These substances fill the endorsed spaces and thus prevent movement and dispersal of insects inside the stored seeds. They also act abrasive to enhance water loss through the insect cuticle, thus killing the insect;

- mixing seeds with plant materials such as leaves of Boscia senegalensis, and mint, Hyptis spp, and pulverised pepper. These materials show a repellent action against storage pests.

At the end of the storage period the farmer prepares his seed for sowing by threshing it (if at all stored on the head) and removing all admixtures like glumes, bits of the rachis and peduncle, etc. This is often done by winnowing and occasionally by sieving. These processes also remove light and small seeds.

Separating good from bad

A fast, easy and efficient method of quality seed selection uses a 10% salt solution to separate good seeds from bad seeds. This method has been demonstrated to extension agents in The Gambia for extension to farmers at the inception of the training and visit system of Agricultural Extension in 1985. The salt solution enhances the flotation of light and damaged seeds, fungal spores and light foreign matter. The good and heavy seeds and pebbles drop to the bottom. The floating portion is decanted and discarded and the sunk portion subjected to flotation one or two more times, after which the good seeds at the bottom are rinsed with clean water to remove excess salt (see sketch). This portion is then sun-dried. After drying, the pebbles are removed by hand picking. The seeds are then treated with dual purpose seed treatment chemicals (containing insecticide and fungicide) before sowing. The farmer thus has vigorous seedlings to start with and is assured of protection of these seedlings from four to seven weeks.

Traditional cultural control practices

Land preparation is the first farmer activity in the field before the rains start. This entails burning all crop residue left in the field after harvest. Millet stemborer larvae (Coniesta ignefusalis) survive the dry season in infested stalks. At the onset of the rains these larvae complete their development and emerge as adults start the infestation cycle on the new crop. By burning these stalks during land preparation these larvae are destroyed, reducing the carry-over population of the pest. As millet stalks are used by farmers for local constructions, partial burning of the stalks immediately after harvest as reported by Adesiyun and Ajayi (1980) for sorghum against the maize stalk borer, Busseola fuoca, can cause high larval mortality without damaging the stalks for the intended construction purposes. In various parts of the Sahel, millipedes constitute important early season pests attacking seedlings of millet, maize, sorghum and leguminous crops. These arthropods prefer moist, humid conditions. As such they take refuge underneath trees, shrubs and other vegetation during the hot part of the day. Knowledge of this behaviour is exploited by farmers to control the pest. Shrubs, weeds and other vegetative matter are cut and heaped in the fields. The millipedes aggregate underneath the heaps (sometimes in numbers exceeding 40 per heap) and are killed either by simple physical destruction or by burning the heaps. Baiting is another method of control against this pest. It entails mixing an insecticide dust (carbaryl 80 wp) with millet or sorghum bran at the ratio of 1:20 by volume, moistening the mixture with water and applying the bait along crop rows. Millipedes feeding on this bait are killed by poisoning.

Weeds

Proper weed management is important against Psalydolytta fusca, a key meloid (blister beetle) pest attacking millet at flowering. Feeding on the millet flowers takes place when ambient

temperatures are low. For most of the day, especially during times of high temperature, the insect shelters beneath the millet plants and underlying seeds. Weeds such as Digitaria spp are secondary hosts of this pest. Weedy fields are found to contain higher densities of the pest when infestation is present compared to clean fields. Some farmers in Senegal and The Gambia grow local early millet varieties with bristled heads. These varieties have been found to withstand attacks because bristles act as protective physical barriers against feeding. Deep ploughing in order to expose residual larval populations, and allowing a two-week delay in planting of short cycle millet varieties (75 days to maturity) to desynchronize the peak flight period of the susceptible phenological stage of the crop, are reported cultural practices against the millet headworm, Heliocheilus albipunctella (Vercambre, 1978, cited by Gahukar et al, 1986).

Integrated Pest Management

The cultural control practices cited above represent a sound basis for an integrated pest management (IPM) of millet pests in the Sahel. The USAID (United States Agency for International Development) funded the CILLS IPM project in the Sahel from the first to the second half of the 1980's. (CILLS is the French acronym for the Permanent Interstate Committee for Drought Control in the Sahel). In this project, supportive infrastructures such as observation posts were put in place in most of the countries for the implementation of IPM programmes. The demand for supportive personnel is yet to be satisfied. In this respect the Dutch-funded regional training centre (Departement de Formation en Protection des Vegetaux) based in Niamey, Niger, offers a two year training programme for middle-level technicians from all the CILSS member countries. This programme goes alongside other programmes designed for other categories of personnel.

Results

Under the CILSS IPM project a reasonable amount of research was conducted with some tangible results on some crops and pests (CILSS, 1985). On millet, for example, some results were tested in pilot projects at the farmer level. These results include the following:

- timely application of insecticides to control larval populations of Heliocheilus albipunctella, the millet headworm;

- identification of some millet varieties (for example with characters based on panicle compactness and/or hairiness) showing promise for utilization as sources of resistance or tolerance to pests such as H. albipunctella and a variety of meloid species;

- Artificial augmentation of Brecon hereto (a parasitic wasp) using techniques applicable by farmers for the biological control of H. albipunctella, an attempt that has yielded encouraging results in Senegal.

These techniques supported by population monitoring by light traps and other means, and the integration of appropriate cultural practices such as those mentioned earlier in this article, form a basis for a programme of better management of millet pests in the Sahel.

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