SHORT COMMUNICATION

Indigenous Crop Pest Management Techniques in Welo

Girma Tesfahun, Wondimu Bayu, and Adane Tesfaye
Sirinka Agricultural Research Center, P O Box 74, Weldia, Welo, Ethiopia.

Abstract

Crop production and pest management practices are centuries old activities for Welo farmers. Diagnostic surveys were conducted in several agro-ecologies of Welo to identify the ways farmers protect crops from insect pests and diseases. Farmers in Welo have been engaged in a constant battle with crop pests and diseases in order to retain the majority of the yield of their crops. Hence, through their age-old observation, they have identified the major pests and diseases of their crops. The knowledge-rich farmers in Welo have developed natural substances and methods as weapons in their fight against pests and diseases. Planting time adjustment, variety selection, use of fermented cattle and goat urine, use of botanicals, and temperature maintenance during storage are some of their weapons against field and storage pests and diseases. This paper will look into farmers' natural weapons against crop pests, which deserve the attention of researchers.

Introduction

Crop production and pest control are centuries old activities for Welo farmers. One of the major constraints farmers have is crop pests and diseases. These farmers have been engaged in a constant battle with these crop pests and diseases. The knowledge rich, but resource poor, farmers of Welo are unable to afford pesticides and are fighting crop pests in their own ways.

Through long experience, farmers have empirically evolved many useful pest control techniques compatible with their biophysical and socioeconomic circumstances. They have developed pest tolerant crop varieties, cultural control techniques and natural substances to fight these pests.

Similarly in other African countries farmers are capitalizing on indigenous pest control techniques such as preparing substances from concentrated hot peppers/chilies, neem leaves, Jimson weed (*Datura stramonium* L.), castor oil, papaya leaves and wood ash for the control of caterpillars, weevils, aphids, garden bugs and other pests (Morna *et al.* 1990; Reijntjes *et al.* 1992; Spoor 1990). Many plant parts like crushed lantana parts, Mint (*Mentha spp.*), pyrethrum powder, fruits of red pepper (*Capsicum spp.*) and black pepper (*Piper spp.*) are reliably effective against storage pests (Gwinner *et al.* 1996). In Uganda powdered tobacco leaf is effective in protecting cowpea from bruchids (Agona *et al.* 1998). The application of neem oil had decreased blister beetle on millet by 75 –76% (Toure *et al.* 1998) and neem kernel extract had prevented bruchid damage to cowpeas in Mali (Dunkel *et al.* 1998).

These days, farmers' techniques of pest control are being partly or totally replaced by agropesticides. However, the available scientific information reveals that pesticides are not doing the job they are supposed to do in many parts of the world. This suggests a different approach basing research on indigenous pest control knowledge that could ultimately lead to the development of environmentally safe, economically feasible, socially acceptable, and effective pest control techniques. However, literature on these indigenous innovations in Ethiopia and especially in Welo is scarce. This study was conducted to identify crop pest and disease-related problems and farmers' indigenous control techniques and to highlight the need for research intervention.

The purpose of this paper is to show how small-scale farmers are rich in technical knowledge and to help scientists understand farmers' ideas, information, and techniques.

Materials and Methods

Diagnostic surveys were conducted at different agroecologies of Welo: Kobo, Habru, Ambassel, Tehuledere, Kalu, Chefa, Legambo, Desse Zuria, and Sekota between 1997 and 1999 to identify farmers' indigenous insect pest and disease control techniques. The surveys were conducted using CIMMYT's farming systems diagnosis approach (Bayerlee and Collinson 1984). Prior to actual field visits, background information and secondary data were collected from Zonal and Woreda (district) Department of Agriculture offices. Discussions on the farming system in general and on insect pest and disease control in particular were held with individual and groups of farmers using questionnaires that consisted of open-ended and structured questions. Using the questionnaire, preliminary information on the indigenous pest control techniques, level of pest problems, and major crops affected were collected.

Results

Farmers provided descriptions of their farming systems, crop pest problems, respective farmers' solutions and decisions in the face of pests incidence. They have also described and characterized their sorghum cultivars in relation to stalk borer and Striga problems.

Pest Problem

A huge amount of grain yield is lost every year due to insects, diseases and weeds in the Amhara region. For instance, in the years 1995-1997 yield losses were estimated to be 37.3%, 11.8%, and 19.9 % by insects, diseases and storage pests, respectively (Yitbarek 1997). Next to moisture stress, crop pests are the most important factors constraining crop production. Stalk borer, sorghum chaffer, tef shoot fly, Welo bush cricket, Russian wheat aphid, weevils and birds are the major insect and vertebrate pests. These pests affect crop production as severely as total yield loss in times of heavy infestation. Diseases such as loose and covered kernel smuts of sorghum, and rust of wheat and barley are also important problems. Striga (*Striga hermonthica* (Del.) Benth and Parthenium (*Parthenium hysterophorous* L.) are also the most notorious weeds in the sub region.

Indigenous Pest Management

Farmers search for solutions based on their needs, because farmers understand their own responsibilities and possibilities the best (ILEIA 1997). The Welo farmers are so innovative that they are making pesticides from such cheap and abundant materials as "Eret" (*Aloe spp.*) leaves, chilies and salt, "Endod" (*Phtolacca dodecandra*), "Nechilo", "Chobe", "Ayderke", wood ash, and cow and goat urine. Moreover, farmers often modify schedule of cultural practices or timing of farm operations to achieve a good pest control with a minimum cost. They have so many low-cost options for pest control. Some of these measures are indicated below.

Insect pests

Stalk borer (*Busseola fusca* (Fuller) and *Chilo partellus* (Swinhoe))

Scheduled planting

Farmers wait till the "*belg*" rainfall stops to prepare the land and to plant sorghum and maize on residual moisture (Fig. 1). Farmers argue that most of the sorghum and maize grown on residual moisture manifest a level of escape from the attack. What farmers are trying to do here is avoiding excess moisture and rapid vegetative growth, which in their opinion is, suitable to stalk borer infestation.

Replanting

This is a very common activity for stalk borer prevention in the sorghum producing areas of Welo. If there is any rain in May and early June following April and early May plantings, farmers will plow under the sorghum seedlings in fear of stalk borer infestation. In mid June, after the rain

in May and early June, they will replant sorghum. But, if the rain continues, they will resort to sowing short season sorghum or tef in July.

Variety selection

Farmers also select relatively resistant/tolerant sorghum varieties to overcome the stalk borer problem, preferring early maturing to late maturing varieties. Farmers report that stalk borer would not attack varieties sown in the second half of June as severely as those planted in April. Table 1 indicates sorghum varieties identified by farmers in the various localities studied as being relatively resistant/tolerant to stalk borer attack. However, as indicated in Table, these varieties are not as productive and preferred as the late maturing cultivars, which are dominant in the cropping system but are susceptible to the pest. Nevertheless, these varieties are important as sources of genes for developing resistant varieties.

Sorghum Chaffer (*Pachnoda interrupta* (Olivier)

Field smoking

Farmers inundate their infested sorghum fields with smoke to repel this insect. They believe that the smoke irritates and forces the insect to fly away. The smoke can be from any available vegetation, cow dung, or straw. Farmers smoke their fields for up to one whole day. They indicated this method to be very effective, but it requires a large amount of both labor and burning material.

Head covering

Farmers with small plots of sorghum cover the sorghum heads with thin plastic sheets. The covering begins at grain filling stage. This activity saves the grain from the insect, but shrinks the size of the sorghum seeds.

Scaring

Farmers also place water-soaked dead chaffers on sorghum heads to scare the insect. Farmers explain that the presence of a dead chaffer body on the sorghum head will repel live chaffers.

Intercropping

Sorghum chaffer normally prefers several other plants to sorghum: "Bakelo" is an example. This plant has very bright yellow flowers, which attract the insect. Farmers intercrop "Bakelo" with sorghum, scheduling the plantings in order to have these plants flowering when sorghum at grain filling.

Use of baits

Banana fruit produces an odor that allures *Pachnoda interrupta*. Aware of this, farmers cut the banana fruit into pieces and treat it with wide spectrum insecticides such as Malathion. Then, they place this bait on the insect's path into their farm. Guava (*Psidium guajava* L.) and local beer residue or "Atela" are also used in the same fashion.

Welo Bush Cricket (*Decticoides brevipennis* Ragge)

Early planting

In areas where this pest is serious, farmers plant their crops earlier than normal. They justify this indicating that the crop will reach maturity before the insect reaches adult stage and be able to damage the crop.

Spraying cow urine and ash

Applying cow urine and ash on to the pest are other tools that farmers have against the cricket. The urine has a killing effect, whereas the ash has an irritating effect on the pest. The ash is used to force the pest to migrate off the infested field. As a side effect, farmers indicated that cow urine has a certain level of burning effect on the crop.

Resistant crop cultivars

In Wag Himra area, where the pest is very critical, a local wheat variety called "Kinkina" is resistant to the cricket. The resistance of "Kinkina" might be through its pile of glumes that can protect, by exclusion, the seeds from the pest.

Border crops

Farmers grow chickpea bordering fields of susceptible crops. They argue that the sticky and salty nature of chickpea plant exudate is uncomfortable for the cricket.

Bordering furrows

Farmers also make deep furrows bordering their crop field in order to keep away the incoming crickets. The furrows will be prepared widely enough to prevent the pest from crossing.

Russian Wheat Aphid (*Diuraphis noxia* (Mordv.))

Water showering

Farmers have got only a means against this critical pest of the highland part of Welo. That is water showering. Farmers spray water on to the crop to wash away the pest.

Weevils

Plot selection

Farmers in general need to have well drained sites to prepare storage pits or to put their granaries. Particularly, farmers in the lowlands, where temperature is higher and rain minimum, prefer cool or shaded places to dig storage pits.

Botanicals

Farmers prepare several pesticides from vegetative materials to protect their grain from storage pests. They place slightly crushed plant materials like "Endod" (*Phytolacca dodecandra* L.' Herit), "Nechilo", "Kinchib" (*Euphorbia tirucalli* L.), Bissana (*Croton macrostachys* Hochst) and "Chobe" as a lining at the bottom and top of the storage pits to exclude different storage pests. They also add "Eret" (*Aloe spp.*) leaves squeeze and pounded chilies alone or mixed with salt on to the grain in the stores. In cases when the grain is kept for seed, it will be dressed with cow or goat urine to avoid weevil damage. Although it varies from individual to individual, many farmers agree that chilies, wood ash and cow or goat urine will enable to keep the product for more than five months in the store without any damage.

Mixing crop seeds and crop with ash

Large seeded grains like sorghum, maize and legumes are stored in mixture with tef, millet and spices to keep weevils off the stored product. By doing so, farmers think that small sized grains increase the density and create suffocation to the pest. In addition, farmers mix their crop seeds with kitchen ash at storage to reduce this same damage.

Sun drying

Farmers also practice sun drying of stored crops usually at monthly interval to aerate the grains and create an unfavorable environment for weevils.

Birds

Homogenous planting

Farmers in a given area follow almost a uniform crop rotation and planting date pattern. One of the reasons for this is their effort to protect against birds. No farmer will sow, for instance, sorghum unless neighboring farms are planted to sorghum. Farmers argue that birds will easily devastate their sorghum if it is the only farm within the area.

Planting schedule

Protection against bird attack begins at the early stages of crop production activity. Sorghum producing farmers in the lowlands of Welo avoid sowing in March no matter how much rain there is. They believe that the sorghum will mature early and, so, will be exposed to severe bird attack.

"Dillessa" / Bending

This is a common activity and is typical of sorghum producing farmers in Welo. Farmers bend down the sorghum plant at maturity to easily scare the birds as it allows them full supervision of the farm. Farmers call this practice Dillessa.

Diseases

Loose Kernel Smut (*Spacelotheca cruenta* (Kuhn.)) and Covered Kernel Smut (*Spacelotheca sorghi* (Link.) Clinton

Seed dressing with cow and goat urine

Farmers traditionally exercise seed dressing with cow and goat urine to protect against smut. They collect cow and goat urine and keep them for some time to let them ferment. Then, they use them for seed dressing of planting materials. Farmers are confident that this practice significantly reduces the risk of smut.

Seed washing

This is another activity to protect smut. Affected heads will be harvested and threshed alone. Then

the seeds would be washed with warm water.

Weeds

Striga (*Striga hermonthica* (Del.) Benth

Crop rotation

Research has revealed that rotating host cereal with trap crops like chickpea, groundnut, cotton, haricot bean, and lablab reduces the striga seed bank in the soil and will reduce yield losses due to striga infestation. Welo farmers, aware of this, have been rotating their sorghum fields with chickpea for a long time period. In fact, the frequency of rotation might not be sufficient to have a great impact on the Striga seed bank.

Variety selection

Farmers have also identified relatively resistant/tolerant sorghum varieties against striga. Table 2 lists those varieties, which are reported to have resistance or tolerance to Striga at different localities. However, as indicated in Table 2, these varieties are not as productive and preferred as the dominant varieties, which are susceptible to Striga. However, if these varieties have genuine traits of resistance, they could be used as genetic sources in the development of a resistant variety through breeding.

"Shilshalo"/Oxen cultivation

The other traditional practice that farmers believe has an impact on striga is *Shilshalo* (oxen-cultivation). Farmers say that performing a shilshalo while the striga seedlings are subterranean will detach the Striga seedlings before they totally attach to the sorghum roots. Farmers make shilshalo at the time that is thought to be the period of striga attachment to the crop roots.

Discussion

These indigenous pest control measures are not the only ones farmers have. These measures are area and time specific, simple, technically and financially sound, and safe in relevant aspects. However, these measures lack uniformity in content and consistency in use. This originates from the varying individual perception of the pests and the unavailability of the preparation materials across all areas.

The basic question to be answered is 'Are these techniques really doing the job they are designed for efficiently?' Farmers normally say yes, but research is not in a position to say anything yet. This paper does not propose that all of these techniques are perfect; rather it intends to bring these techniques into the sight of research so that they can be technically studied. Therefore, research should be conducted to identify which techniques are doing well and which ones are not. The rate of application and the chemical constituents having the killing and/or repellant effects need to be assessed. Also ways of commercializing effective materials should be studied.

Small-scale farmers are innovators much more than any agricultural expert expects them to be. Their traditional knowledge is more than simple and negligible. The effectiveness of their endeavors has maintained crop husbandry under difficult circumstances.

So far, in Ethiopia, interest and efforts on indigenous pest control have been overwhelmed by the interest to use pesticides to such an extent that the farmers' knowledge base is almost forgotten. Perhaps such an approach result in developing complex, incompatible, and unaffordable technologies.

From this assessment, it is evident that a closer examination of indigenous pest management by scientists could give valuable information on how to develop control strategies which are suitable for small-scale farmers and which are least damaging to the environment. Therefore, the scientific research approach has to look deep into this poorly exploited area of knowledge and build on it to develop integrated pest management interventions.

Table 1. Sorghum cultivars identified by farmers as having relative resistance/tolerance to stalk borer in the different localities studied

Cultivar (Local name)	LGP**	Market value	Assessment area	Quality
Cherekit	Medium maturing	Poor	Kalu	Poor for all food types
Humera*	Early maturing	Poor	Ambassel, Tehuledere, Chefa, Kalu & Habru	Good for Injera & Telia
Ahyo (Wofaybelash)	Medium maturing	Poor	Kalu, Tehuledere & Ambassel	Poor for Injera
Jigurti*	Early maturing	Poor	Ambassel, Habru, Kobo & Chefa	Good for "Eshet" & Tella, but poor for Injera
Bukassie	Late maturing	Very good	Habru	Very good for Injera

** Very good tolerance*
*** LGP = Length of Growing Period*

Table 2. Sorghum cultivars identified by farmers as having relative resistance/tolerance to striga

Cultivar (Local name)	LGP*	Market value	Assessment area	Quality
Cherekit	Medium maturing	Poor	Kalu	Poor for all food types
Humera	Early maturing	Poor	Ambassel, Tehuledere, Chefa, Kalu & Habru	Good for Injera & Tella
Ahyo	Medium maturing	Poor	Kalu, Tehuledere &	Poor for Injera
Boresh/Borie	Medium maturing	Good	Ambassel	Very good for Injera

LGP = Length of Growing Period

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