"Sorghum in the Eighties" Nov. 2-7, 1981 - ICRISAT

COMMENTS ON THE "BIRDS" PAPER BY BRUGGERS AND JAEGER, AND ON THE "STRIGA" PAPER BY RAMAIAH & PARKER

DISCUSSANT PAPER BY H. DOGGETT

General

Witchweed and birds have the distinction of being the two most serious causes of crop loss on cereals in the rainfed semi-arid tropics: yet, over the past thirty years, Striga has received least attention from national and international funding agencies. Also, much more attention to bird control is required. I would add to the authors' comments that Striga is a farming problem, needing attention from those with practical farming experience in the tropics. This is true of birds to a lesser extent, but both birds and Striga require control measures which are far beyond the resources of the small farmers in the semi-arid tropics. Control is needed on a government scale and a regional scale, and more money is required from donor agencies. As stressed in the paper on birds, integrated crop protection systems are required for both sets of pests, and these must form a part of the total farming systems followed.

Birds

Turning first to the paper on birds, it is encouraging to learn that control operations are still continuing, and the methodology is being improved.

The economic cost of birds is rather greater than that quoted. Large areas of several African countries are growing maize where sorghum or millet are the more reliable crops with better, more consistent yields across seasons. Maize does not need bird scarers. Maize crop failures in some seasons are preferred to bird losses in all seasons. The area under the high tannin grains has also been accepted as inevitable. People have learnt how to use them, and perhaps nothing can be done to frustrate the birds, at least not until very much larger areas of Africa are under the plough. The paper brings out clearly that, like Striga, the crop lost which could otherwise have been harvested, represents a substantial production loss which usually has to be replaced by imports of grain.

The possibilities of a permanent reduction in the quelea population are clearly small, so crop protection is the only course. The farming system modifications of planting time and maturity are the least expensive way of reducing bird damage. In Tanzania, a short-term crop planted in February in the northern part of the Lake region makes out all right, provided that there are good enough showers to get it established: birds are little trouble then. Further south, the rainfall is lower and less reliable: more work needs to be done. In Uganda, the weaver birds decimate grain in March-April plantings: but August plantings of 100-120 days varieties have no bird problem, at least in Teso district. Again, more studies are needed in other parts of the country.

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Other methods of control cost money: chemical repellants may need subsidies for the small farmers in the poorer areas: Methiocarb requires a cash outlay: family bird scaring does not. Studies are needed of farmer-or rather, farmer's wife - reactions to the flavour of the products prepared from grain which has been treated with methiocarb. It is to be hoped that the search for cheap and effective bird repellents will be continued.

The control of birds illustrated in tables 3 and 4 of Brugger's & Jaeger's paper is very encouraging: Clearly,much can be done. However, we need some cost figures: and control by attacking colonies of quelea must surely be quite expensive, although evidently good progress has been made in making the control operations more efficient, more cost effective.

There is one small comment on table 1. The figure of 86 percent for Uganda as the percentage of sorghum and millet in total cereal production is misleading in this context, since the millet is eleusine (finger) millet, which is not vulnerable to birds until it has ripened. It is customary to go through the fields at intervals at harvest time, cutting the heads, as they ripen.

An important and welcome emphasis in the presentation on birds is the emphasis on training staff. Has any serious training of any kind yet been undertaken for Striga? Can any progress be expected until trained local staff are available?

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Striga

The Striga paper reminds us of the variability in Striga populations: in all sexually reproducing organisms, much variability in morphological and physiological characters must occur. The difference in breeding systems result in S. asiatica being a mixture of lines, while S. hermonthica populations consist of heterogeneous individuals. In both cases one has the typical interaction of host and parasite illustrated by wheat rusts: a resistant host plant automatically excercises a selection pressure on the population of the parasite which favours forms able to break down the resistance.

Crop loss:

The information on the disturbed balance of the growth hormones of the host plant is interesting, and is likely to account both for the drought symptoms, and for the disproportionate damage inflicted by the young Striga plant on the young host plant. However, with a crop growing in the field and reaching the grain-filling stage, the additional burden of feeding large numbers of Striga plants must be responsible for much crop loss. My figures showed that each Striga plant was associated, on average, with a grain loss of 2 to 3 g. per hectare, which even at 40,000 sorghum plants/ha must represent less than the average weight of a Striga plant when correction has been made for the difference between the moisture content of the grain

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and the Striga plant. It is the Striga numbers which are so devastating. The damaging effects of Striga are well established, even if difficult to quantify, ~~etc~~.

Our main concern is with STRIGA CONTROL. Proper control can only come from improved farming systems, which integrate a series of measures each of which contributes something towards the reduction of Striga numbers.

Resistance:

The biggest component is host plant resistance, but his should be a component of a system and not the sole defence against Striga. The resistance required is one which results in relatively few Striga plants emerging and flowering, while at the same time maintaining an acceptable yield level, i.e. the host must tolerate the Striga plants which do establish.

The indications of an interaction between nitrogen and resistance are most interesting. It looks as though some forms of resistance are not expressed unless a minimum basic level of N is present in the soil.

Progress in breeding for Striga resistance has been slow: the resistance of Framida was known at least 25 years ago, ~~other~~ and the mechanism reported 22 years ago.

Testing

The development of the technique for assessing stimulant production

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marked a big step forward in the methodology of breeding for resistance. Field testing for Striga resistance is difficult: Obilana in Nigeria uses hill planting for early testing: ICRISAT is trying interspersing frequent control plots. I would like to see more population breeding used, letting the Striga itself select the resistant sorghums. Sorghum populations could be sub-divided and grown on the relatively small patches of heavily infested Striga land which are characteristic of the bad Striga areas in Africa as well as in Asia.

Strains:

Attention has been drawn to Striga strains. There can be no doubt about the existence of inter-crop resistant strains. There are probably also intra-crop resistant strains but I would like to re-enforce the cautions expressed in the paper. Long-term testing is required to establish the existence of these. The variability of Striga populations is such that there can be marked seasonal differences in Striga numbers due to interaction with environmental differences.

The agronomic measures required to supplement resistance in the host are effective on land in good heart which is being well farmed. Building up the soil fertility, including using sufficient nitrogen, herbicides, weeding out Striga, crop rotation with false

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hosts, in combination with resistant cultivars, would control Striga at a low level. The answer to the question "would this be economic?" must surely be "it has got to be made economic", by adjusting prices and subsidies. We cannot afford to have large areas of land abandoned because of Striga, or low grain yields over extensive areas for the same reason.

Once Striga has got a grip on the land, as it has in many parts of Africa, the measures outlined are totally inadequate. It would take years to achieve any progress. Heavy subsidies for cleaning up Striga infested land are inevitable, and must be faced.

Some of the enormous reservoir of Striga seed in the soil must be reduced. These are three possible methods:-

1) Trap cropping with susceptible hosts, and ploughing under before the Striga has flowered. This would need to be repeated several times, and in many parts of Africa would be difficult or impossible. Were it to be done successfully, the problem of keeping the Striga from building up again would be considerable. This is possible on large farms, but not for the small farmer. The most effective trap crop for sorghum Striga is often pearl millet.

2) Ramaiah and Parker draw attention to ethylene injection, which will germinate 90 percent of the Striga seed in one application. It requires tractor mounted infection equipment, supplemented by a backpack applicator for akward corners. The area of the Carolinas infested with Striga in 1957 was around 20,000 ha. Today, it is around 150,000 ha. Ethylene injection began in 1973,

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when 300 ha were treated. Today, only some 4,000 to 4,500 ha are treated annually, because of limitation of funds. If that is the situation in the U.S.A., one has serious doubts on how much could be achieved in the third world. The backpack applicator is not suitable for large areas: each thrust treats a cylindrical volume of some $7m^3$. It will take a long time to do 5 ha. Even if large scale ethylene treatment was somehow done, how would the Striga be prevented from building up once more? Again, this is a possible approach for large farms, but not for the small farmer.

3) The third possibility is the synthetic analogues of strigol. One of the first things I did in 1972 after joining IDRC was to look for a scientist to develop strigol analogues. Professor Alan Johnson of Sussex University agreed to operate a project, and the Board of IDRC agreed to support it. Some of these compounds show good promise. GR7 combined with paraquat or oxyflurofen was as effective as ethylene in tests in the USA, and also useful alone. There appeared to be a synergistic effect. However their value has not yet been clearly demonstrated in the third world.

oxyfluorfen

Compounds of this type hold out the best hope of a practicable method of reducing the burden of Striga seed in the soil. Subsidies, perhaps heavy subsidies, would be needed on the GR7, the fertilizers and the herbicides. However, I am sure that a crop rotation, with fertilizer, GR7 or other analogue of strigol used with a herbicide, together with good management of the crop (especially weeding) would get on top of the Striga. There would be a steady build-up in fertility accompanied by a steady decline in the number of Striga seeds in the soil. The land would become much more productive, and the farmer,

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having himself cleaned up his own land, would keep it that way.

In my view, financial help in the most cost-effective way which can be devised for the control of both Striga and birds should be a major concern of donor agencies. This approach would be of much greater value than some of the large scale production schemes; much grain could be saved, as these papers have demonstrated. I would strongly urge the need for more donor agency support. There is only one solitary scientist, a plant breeder, working full-time on Striga in the whole of developing Africa. Yet it is the most serious problem, other than perhaps birds. At least one team of scientists is essential, and further support is needed for the bird control work.

I have commented only on a few topics in the Striga section of this comprehensive paper, but the proceedings of the recent Striga Workshops at Ouagadougou go thoroughly into many of the problems discussed by the authors.

Finally, let me add that I found both papers comprehensive and very informative: they form an excellent basis for our discussions,

MD:psn
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