NODULATING LEGUMINOUS WEEDS OF SOME MAJOR CROPS OF PAKISTAN

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ABSTRACT

A survey was conducted to explore the nodulating leguminous weeds of some major crops of Pakistan. A total of 20 weeds are reported from the major crops which consisted of carrot, cotton, maize, potato, rice, sugarcane, tomato and wheat.

KEYWORDS: Nodulation, leguminous weeds, major crops, Pakistan.

INTRODUCTION

Generally, weeds are defined as plants growing where they are not desired. Many weeds grow in areas where they are not well adapted, but may still thrive in the absence of competition. Usually they are favored by vigorous reproductive powers. Most of them are tolerant to adverse conditions of growth such as extreme heat or cold, drought or excessive moisture, saline or water-logged environments and marginal or disturbed soils. Weeds often possess hard seeds, underground root stocks or tubers, and show greater persistence.

Weeds compete with crops for nutrients, water and light. They are often fast-growing and more efficient in utilizing nutrients than are crop plants and therefore have a distinct competitive advantage (Holst et al., 2007). Weeds may be pathogenic or act as an alternative host for insect pests, nematodes, and fungi. Certain weeds secrete substances that inhibit the growth of other plants. In short, weeds are
often harmful to crop plants and may cause serious yield losses. Their
effect on crops is not as spectacular as insect pests or plant diseases, but
they may lower yields as much as 80% and often by more than 50% if
not controlled (Parker & Riches, 1993).

Weeds belong to practically all plant families but certain
families, particularly Asteraceae, Brassicaceae and Poaceae constitute
the major weed flora throughout the world (Nasir & Ali, 1972;
Muenscher, 1980; DiTomosa & Healy, 2007). Leguminous plants
enrich the soil with fixed nitrogen and also increase the rhizobia
population (Amarger, 2001). However, under certain conditions many
legume species usually considered as harmless, may turn into weeds
difficult to eradicate. No research has been carried out in Pakistan to
determine the role of nodulating legumes as weeds. The present study
is aimed at exploring the nodulating weeds of the major crops of
Pakistan.

**MATERIALS AND METHODS**

Periodic field trips were made to various parts of Pakistan
during different seasons of the year and major crops were screened for
nodulating leguminous weeds. The major crops included cotton, maize,
rice, sugarcane and wheat. The vegetables surveyed were carrot,
potato, and tomato. In the present report a “leguminous weed” means
either a legume of no agricultural significance or one which, though
used in agriculture, is growing in some other crop. At least five
nodulated plants were collected per field of crops and the frequency of
nodulation was determined by counting the average number of nodules
per plant. Only positive reports of nodulation were recorded. The
flowering period of these weeds was also observed. Special care was
taken to distinguish root nodules from other kinds of malformations
such as those caused by nematodes, insects or other root-inhabiting
parasitic microorganisms (Truchet et al., 1989). Weeds were arranged
alphabetically within species and their distribution in various crops of
Pakistan is described. The nomenclature and classification follow
Nasir & Ali (1972) and Nasir & Rafiq (1995), and author citations
RESULTS AND DISCUSSION

Leguminous weeds found to be nodulated are listed in Table 1. The plants examined included herbs, vines and shrubs. A total of 20 leguminous species are reported as nodulating weeds of different major crops. The crops included carrots, cotton, maize, potato, rice, sugarcane, tomato and wheat. Such weeds were also observed growing in a number of different summer and winter vegetables, as well as in grassy lawns. Most of the weeds were abundantly nodulated, indicating wide spread and large populations of rhizobia (Table 1).

Various soil bacteria have been reported as natural antagonists against parasitic weeds (Mabrouk et al., 2007). As reported in a number of plant microbe-interactions, antagonistic bacteria interact by competition and antibiosis (Buchenauer, 1998). Rhizobia released from legume nodules activate various defense responses, ranging from hypersensitive cell-death of infected cells, to accumulation of enzymes responsible for defense reaction (Mabrouk et al., 2007). Apart from their usual role, rhizobia also fix atmospheric nitrogen. Most of the nitrogen added to the biosphere each year is supplied by nitrogen-fixing plants (Amarger, 2001; Vessey et al., 2004). Although their potential has been established, the exploitation of such novel nitrogen sources will be dependent on the identification of limiting factors and agronomically feasible practices to eliminate them. The general account presented here is an essential first step in quantifying the contribution of these nodulating weeds to the nitrogen cycle of the biosphere.

ACKNOWLEDGEMENTS

Special gratitude is expressed to Joseph H. Kirkbride, USDA-Agricultural Research Service, Beltsville, MD, for checking the nomenclature author citation of these plants.

LITERATURE CITED


Table 1. List of nodulated leguminous weeds of some major crops of Pakistan.

<table>
<thead>
<tr>
<th>Species</th>
<th>Nod. Freq.</th>
<th>Flowering Period</th>
<th>Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Alysicarpus monilifer</em> (L.) DC</td>
<td>+</td>
<td>Oct</td>
<td>Cotton, maize</td>
</tr>
<tr>
<td><em>Indigofera cordifolia</em> Heyne ex Roth.</td>
<td>+</td>
<td>Aug-Oct</td>
<td>Cotton, maize, potato, tomato, summer veg.</td>
</tr>
<tr>
<td><em>Indigofera hochstetteri</em> Baker</td>
<td>+</td>
<td>Aug-Oct</td>
<td>Cotton, maize, potato</td>
</tr>
<tr>
<td><em>Indigofera linifolia</em> (L. f.) Retz.</td>
<td>+</td>
<td>July-Oct</td>
<td>Cotton, potato, tomato, summer vegetables</td>
</tr>
<tr>
<td><em>Indigofera oblongifolia</em> (L.) DC</td>
<td>+</td>
<td>Sep-Nov</td>
<td>Cotton, maize, potato, tomato, summer veg.</td>
</tr>
<tr>
<td><em>Lathyrus aphaca</em> L.</td>
<td>++</td>
<td>Feb-Apr</td>
<td>Wheat</td>
</tr>
<tr>
<td><em>Melilotus alba</em> Desr.</td>
<td>++</td>
<td>March</td>
<td>Carrot, mustard, onion, pea, sugarcane, wheat</td>
</tr>
<tr>
<td><em>Melilotus indica</em> (L.) All.</td>
<td>++</td>
<td>March</td>
<td>Carrot, mustard, onion, pea, sugarcane, winter vegetable</td>
</tr>
<tr>
<td><em>Medicago laciniata</em> (L.) Mill.</td>
<td>++</td>
<td>March</td>
<td>Wheat</td>
</tr>
<tr>
<td><em>Medicago lupulina</em> L.</td>
<td>+++</td>
<td>Mar-Jun</td>
<td>Wheat</td>
</tr>
<tr>
<td><em>Medicago polymorpha</em> L.</td>
<td>+++</td>
<td>Mar-May</td>
<td>Wheat</td>
</tr>
<tr>
<td><em>Medicago sativa</em> L.</td>
<td>+</td>
<td>May</td>
<td>Carrots, wheat</td>
</tr>
<tr>
<td><em>Sesbania bispinosa</em> (Jacq.) W.F. Wight</td>
<td>+++</td>
<td>Jun-Sep</td>
<td>Cotton, rice, summer vegetable</td>
</tr>
<tr>
<td><em>Sesbania sesban</em> (L.) Merr.</td>
<td>+++</td>
<td>Aug</td>
<td>Maize, potato, rice, summer vegetables</td>
</tr>
<tr>
<td><em>Trigonella monantha</em> C.A. Meyer</td>
<td>++</td>
<td>April</td>
<td>Carrot, coriander, wheat, winter vegetables</td>
</tr>
<tr>
<td><em>Vicia monantha</em> Retz.</td>
<td>++</td>
<td>Feb-Apr</td>
<td>Sugarcane, wheat</td>
</tr>
<tr>
<td><em>Vicia peregrina</em> L.</td>
<td>++</td>
<td>Apr-May</td>
<td>Sugarcane, wheat</td>
</tr>
<tr>
<td>Species</td>
<td>Nodulating Status</td>
<td>Blooming Period</td>
<td>Associated Crops</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------</td>
<td>----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td><em>Vicia sativa</em> L.</td>
<td>++</td>
<td>Jul-Aug</td>
<td>Sugarcane</td>
</tr>
<tr>
<td><em>Vigna aconitifolia</em> (Jacq.)</td>
<td>++</td>
<td>Sep-Oct</td>
<td>Cotton, potato, tomato,</td>
</tr>
<tr>
<td>Marechal</td>
<td></td>
<td></td>
<td>summer vegetables</td>
</tr>
<tr>
<td><em>Vigna trilobata</em> (L.) Verde</td>
<td>++</td>
<td>October</td>
<td>Cotton, potato, tomato,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>summer vegetables</td>
</tr>
</tbody>
</table>

**Nodulating status:**
- + Indicates 1 to 5 nodules per plant
- ++ Indicates 6 to 10 nodules per plant
- +++ Indicates more than 10 nodules per plants