

Integrated Orobanche Management Brochure November 2014

Prepared by EMBRAPA, ICARDA, EIAR and ARARI cooperation



In Ethiopia Amhara regional state South Wollo zone Kuta Ber district Flagober Kebele farmer Seid Abebe (indicated in the above figure in the right) controlled by integrated Orobanche management success satisfaction compared with the left side 100 % yield loss due you Orobanche Parasitic weed.

Introduction

Orobanche is categorizing under Orobanchaceae family and it is complete parasite. From more than hundred species in the world seven of them are important parasitic weeds on crop production. This parasitic weed distribution in Ethiopia increases from time to time and highly affects different crop types. Five Orobanche species found in Ethiopia (Orobanche minor, O. cernua, O. crenata, Phelipanche ramosa and O. cumana) and affects faba bean, sunflower, potato, tomato, Nueg, kale flower, linseed, tobacco and other crops reduce yield. O. crenata Orobanche species affect faba bean and mostly distributed in major growing areas of northern Ethiopia (Fig 1and 2).

Orobanche suitable environment for germination

Orobanche is a flowering plant that parasitizes the root of many economically important crop plants (Fig.3). Seed has very small size 0.3 by 0.3 mm length and width and 3-6 micro grams seed weight. Plant height ranges from 15 to 100 cm. The seeds can remain viable in the soil from 10 to 13 years and seeds only germinate under the influence of root exudates from the root of the host plant or certain non-host plants. Before germination it needs one to two weeks preconditioning. If it reaches the root of a host plant, the apex penetrates the root tissue and subsequently makes a connection with the vascular tissues in the root and a haustorium is developed on the host plant.

The weedy *Orobanche* spp. is annuals that reproduce by means of seeds and one plant can produce from 3,000 to 200,000 seeds.

Besides host plant low fertility and well drained soil is suitable for germination. In wet soil the concentration of exudates from host plant becomes low and affects germination. For germination the seed needs from 18 to 25 ° C mean soil temperature.

Table1. Orobanche parasitic weed host plants

Orobanche spp.	Host plants
O. crenata	Lentil, Faba bean, Vetch, Field pea, grass pea
O. cernua	Carrot, Tomato, Tobacco
O. cumana	Safflower
Phelipanche ramosa	Rape seed, Tomato, Tobacco, Potato
O. ramosa	Faba bean, Sunflower, Nueg, safflower, Tobacco, Groundnut



Integrated management of Orobanche

Hand weeding

Orobanche infested field hand weeding is not effective on host plant damage but it lend a hand to reduce seed bank in the soil. It involves pulling the shoots out by hand before flower and burn.

Use of tolerant varieties

An approach for tackling the Orobanche problem is selection and use of resistant or tolerant varieties. Unfortunately in Ethiopia released and registered resistance or tolerance varieties within a crop are limited in number. Recently released faba bean variety ILB-4358 (Ashengie) by Alemata Agricultural Research Center gives higher yield in Tigray and Amhara regions of faba bean growing areas on Orobanche infested field.

Crop Rotation

Orobanche seed quantity in the soil can be reduced by crop rotation. Host plants like cereals, fenugreek, cowpea, soya bean, chickpea, clover and dismodium are the major ones. In long rotations (four to five years) the seed bank may be reduced by loss of viability with time. Moreover, it may decrease by growing a trap crop which domino effect in suicidal germination; by growing catch crops which are destroyed at harvest before seed production of *Orobanche* the seed bank is also reduced.

Chemical control

Amhara Region Agricultural Research Institute (ARARI) and International Center for Agricultural Research in the Dry Areas collaborative research output revealed that two times application of 144 gm/ha Glyphosate –Isopropylamine Salt on faba bean field during flowering (during first flowering and after one week from first application) reduced weed density, increased yield and it was economical. A person who participates on chemical application should wear safety clothes (Gaunt, eye glass, shoes and protective close). After application of chemicals a person should bath, clean safety clothes properly by soap with warm water and put it separately. Besides this spraying equipments should be cleaned. Protect chemical from eye and any body parts contact, entering to our mouth and pollution of nearby water bodies. Unfortunately a person infected by chemical first aid should be given if it is risky a person should be immediately treated in health centers. Chemicals expired date, storage system and empty container removal, please follow manufacturers on container description and guide. Besides the above listed and related technical issues, getting consulting, practical training and support from station Agricultural Development Agent or Office of Agriculture Protection Expert is strictly advised.

Integrated Orobanche Control Action Plan

To reduce the effect of *Orobanche* weed on crops effectively, integrated use of the above listed control methods should be underlined issue. So, crop rotation, use of tolerant faba bean variety (Ashengie), one to two times Glyphosate application (see above) and hand

weeding (see above) integrated use controls parasitic weed in long term and effectively.

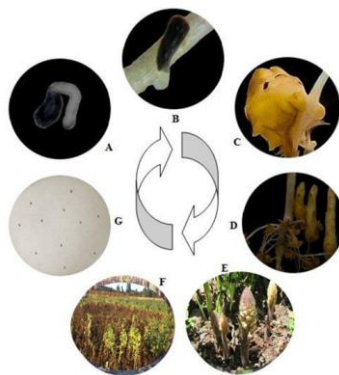


Fig. 3. *Orobanche* parasitic weed cycle and seed: (A) Seed during germination from 3 to 4mm radical on apex connected with faba bean root sticking body (appressorium) emerged (B) parasitic weed by using enzyme inside faba bean plant root cell sucking food, (C) after sucking food on faba bean plant root cell orobanche nodule development, (D) shoot died and then replaced by Tubercle, (E) *Orobanche* plant branches emerged on faba bean root inside the soil and flower, (F) Matured *Orobanche* and (G) *Orobanche* seed (Fig. Partially from Maria et al 2013.; plant develop.20:71-78).

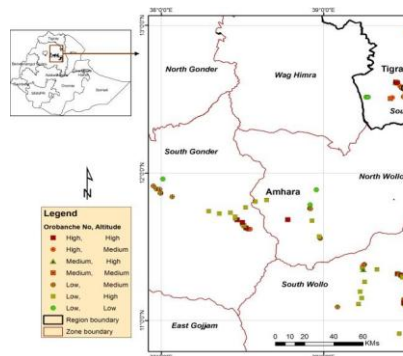


Fig. 1. Orobanch distribution. Altitude meter above sea level, low 1986 to 2138 m, medium 2206 to 2747m.

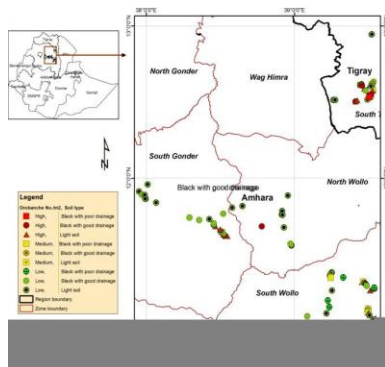
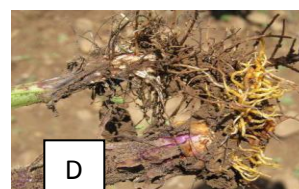
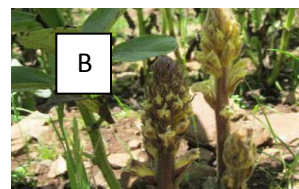


Fig.2. Orobanch distribution amount in soil type. Orobanch plant branch number in m^2 , low 1 to 10, medium 11 to 30 and high greater than 30.



Picture (A) Orobanch (right) and faba bean root (left) symbiosis, picture (D) symbiotic visible, picture B and C Orobanch plant/branches on faba bean root linkage. Picture from faba bean plant highly affected area, South Gondar, Tach Gaynt district.



From different research center researcher integrated orobanche control field visit and evaluation in 2014 at South Gondar zone.

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