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A Review on Faba Bean Gall (Olpidium Viciea) 'Qormid' Disease and Its Managements in Ethiopia

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Abstract
Plant diseases are of paramount importance to humans because they damage plants and plant products on which humans depends for food, clothing, furniture, the environment and in many cases the housing. The kinds and amounts of losses caused by plant diseases vary with the plant or plant products, the pathogen, the locality, the environment, the control measures practiced and combination of these factors. In Ethiopia, a diverse variety of diseases affects faba bean production. However, in recent time gall forming faba bean new disease has become a very serious disease that seriously affected the most faba bean producing areas of the country. The literature review carried out to explore faba bean gall disease on faba bean crops and its management in Ethiopia that would upgrade the agricultural sectors. Description of faba bean gall disease, its causal agents, distribution, symptoms, survival, and varies management strategies are gathered and compiled thoroughly from the available publications.
Keywords: Faba bean crops, Gall disease, Symptoms, Control mechanisms

Background

In Ethiopia, a diverse variety of diseases affects faba bean production. However, in recent time gall forming faba bean new disease has become a very serious disease that seriously affected the most faba bean producing areas of the country ([6][8][1][3][5]. The disease existed for a long period in the Amhara region but well recognized after 2010. Locally, the disease is known by different names: such as *Qormid (North Shewa and South Wollo), Kolsim and Kortim (North Gondar), Aqorfid (East Gojam), Chimid and Kurnchit (South Gondar)*; but in many places it is known by the name '*Qormid'* which is based on its symptoms on the leaf, in local Amharic language. The disease was highly expanding and distributing aggressively in the northern and central part of Ethiopia from year to year [8].

Therefore, this literature review carried out to explore faba bean gall disease on faba bean crops and its management in Ethiopia that would upgrade the agricultural sectors. Description of faba bean gall disease, its causal agents, distribution, symptoms, survival, and varies management strategies are gathered and compiled thoroughly from the available publications.

Methodology

Explanation of faba bean gall disease, causal agent, distribution, time and intensity of disease incidence and severity, symptoms, survival, spreads, environmental factors for disease development, yield losses and various disease management strategies corresponded to this alarming disease in Ethiopia are collected and compiled up thoroughly from the available publications. Some results are summarized in tables, graphs, pictures and texts with definite review of faba bean gall disease and its management in Ethiopia.

Host/ Species Affected

Faba bean gall disease is very pathogenic to faba bean crop. The pathogen had a wide host range including Pea, Rapeseed, Cabbage, Cucumber, Spinach and Buckwheat, but not Soybean, Kidney bean and other legume crops as the determined using artificial inoculation in microscopic and pathogenicity examination in 1912 in Japan and later in 1936S reported by Kusano ([11][6].

When and How are faba bean infected in Ethiopia?

Recently,a newly emerged faba bean gall disease is locally known as *"Qormid"* has become a serious threat to faba bean production in some parts of Ethiopia causing a yield loss as high as 100%. The disease was first reported as a faba bean gall in North Shoa (Degem, Bash Area of Menz Mama and Mojana Wedera district) in 2010. Farmers witnessed the appearance of the disease six years ago in 2011 in Oromia [8]. The newly observed faba bean gall disease was found the most devastating and widely disseminated in the area within a few years since its occurrence.Faba bean plants are susceptible to faba bean gall disease in their growth stages from seedling to pod setting. However, it was very serious at seedling to flowering stages [6] [1] [4][3] [2].The Transmission of faba bean gall is via seed from infected plants crop residues(debris) and soil[9].

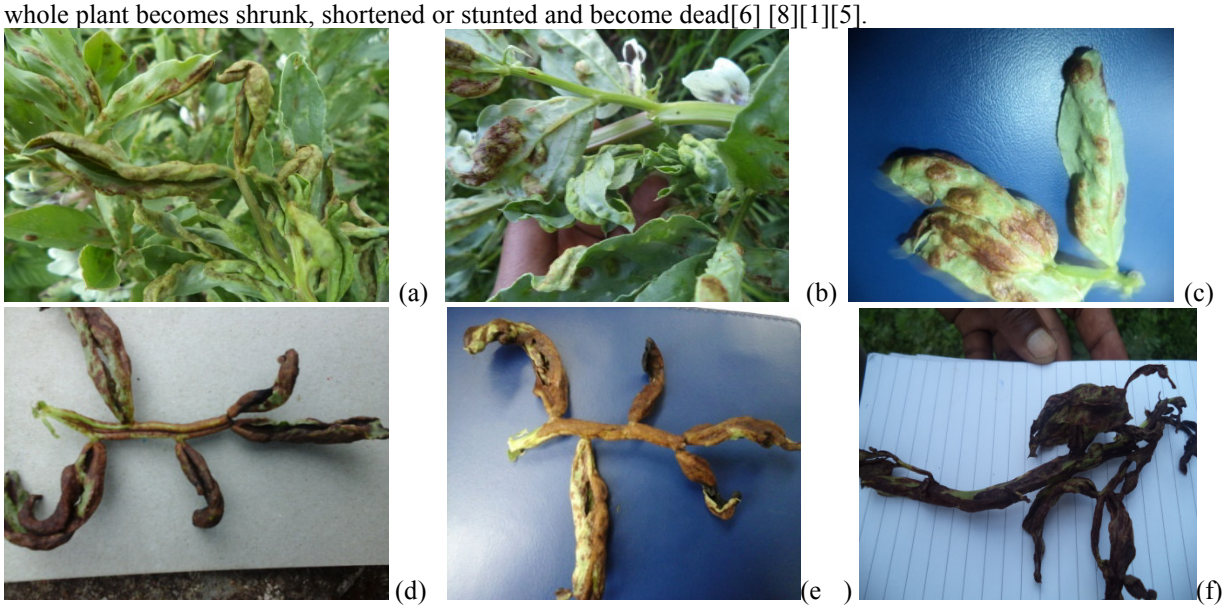
Symptoms

Faba bean gall causes several of symptoms in faba bean depending upon growth stages of the crop, age of

infection and environmental condition. Symptoms of faba bean gall mainly appear on leaves and stems. The initial symptom is green and depressed on one side of the leaf and swells on the reverse side or underside of the leaf, and then it becomes brownish and extends to the stem [6]

The spot immediately changes to brown lesion and it covers the whole lower leaves and the stem. The spot changes from circular to slightly irregular shape. Mature leaves develop coalescing necrotic spots that are surrounded by white lesions. There are 10 to 30, with a maximum of more than 50 small galls on one small leaf and 20-30 galls often coalesce adjacently to form huge galls, resulting in rolling up(cupping) and abnormal growth of leaves[10].

In severely infected plants, circular to irregularly shaped brown lesion or gall also appear on stem and whole plant becomes shrunk, shortened or stunted and become dead[6] [8][1][5].

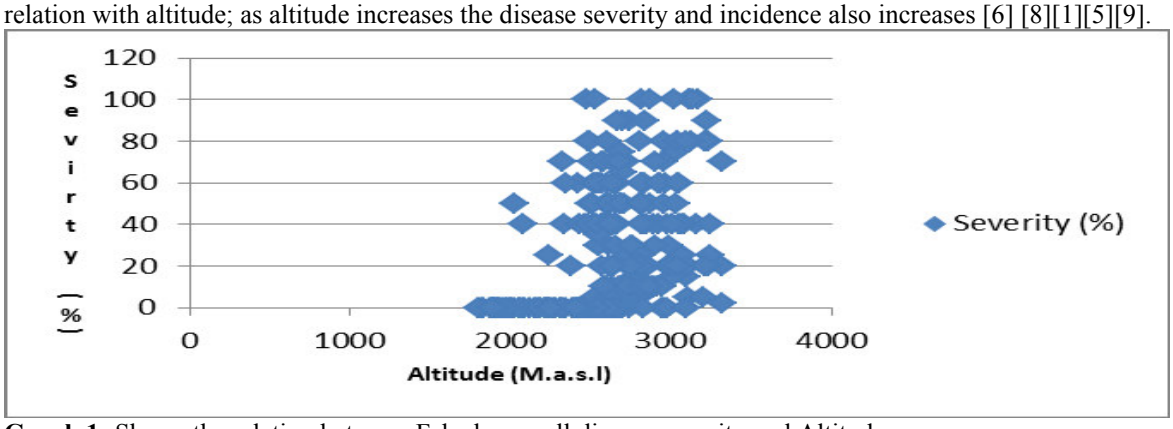


(a)=Curled the whole leaves, (b) and (c) = gall ready to burst, on whole leaves and single leaf, (d) = shrunken (twisting) single leaf,(e) = Dead and dried of single leaf, (f) = Dead and dried of the whole plant parts

Biology and Ecology

The causative agent of faba bean gall *Olpidium Viciae (Kusano*) first reported as a new species in 1912 in Japan latter in 1936 in china [11]. In Ethiopia, it was identified by microscopic, cultural and pathoginicity test done at Holleta Agricultural Research Center in 2011 [6].In a recent time gall forming faba bean new disease has become a very serious disease that seriously affected the most faba bean producing areas of the country [6] [8] [1] [3] [5].

However, the disease was differences in incidence and severity within the districts variable classes, altitude, varieties, growth stage, plant population, planting date, previous crop, weed population and soil type were high in the country. The independent variables: districts, altitude, growth stage, plant population, previous crops, weed population, drainage system and soil types were significantly associated with high incidence and severity of faba bean gall disease as single predictor in the logistic regression model [3].Faba bean gall disease has direct relation with altitude; as altitude increases the disease severity and incidence also increases [6] [8][1][5][9].



Graph 1: Shows the relation between Faba bean gall disease severity and Altitude.

Table1. Pearson Correlation Coefficient of faba bean gall disease severity with Altitude in 2015/16 in western Oromia, Ethiopia.

	Altitude	FBGS
Altitude	1	—
FBGS	0.42**	1

**=highly significant, ns= non-significant, FBGS= Faba bean gall severity

Impact

In microscopic and pathogenicity examination, the causal pathogen was found to be *Olpidium viciae* (Kusano) and was very pathogenic to faba bean that kills most of the inoculated plants in two weeks. The inoculation of faba bean plants and detached leaves with inoculums prepared from infected leaf produced the same tiny galls in the greenhouse at Holetta Agricultural Research Center, confirming its strong pathogenicity [6]. The disease can completely devastate faba bean crops with 100% crop losses.

Prevention and Control Mechanism

Based on faba bean gall management experiences in Ethiopia appropriate disease management practices in faba bean production fields, including uses of appropriate fungicides, adjusting best cropping system and removal excess surface water can prevent the spread of the disease. When individual plants with faba bean gall show symptoms, faba bean production fields must be carefully inspected and plants that appear infected removed immediately. The best approach for the management of faba bean gall disease is to employ integrated pest management practices encompassing cultural control such as crop rotation, crop diversification, seed treatment, removal of crop debris and soil surface water, foliar fungicide application, host plant resistance.

Cultural control and sanitary measures

Crop rotation can effectively control any disease. Producers are advised to practice crop rotation for at least two seasons with alternative cereal crops and Gomenzar.Intercropping reduces/eliminate the inoculation by rotating with cereals or Gomenzar and increases the land utility and abundance of natural enemies [6][9]. It is necessary to use good field sanitation methods, including weed control and burning of diseased crop debris measures to eliminate alternative hosts for potential vectors. Seeds from infected field should not be recycled.

Chemical Control

When fungicides like Beylaton, Ridomil and Mancozeb used as manufacturers' recommendation the disease severity minimized and Grain yield was maximized [4].Application of three sprays of Metalaxyl 8% + Mancozeb 64% WP and Triadimefon 250 g/l had reduced the level of the disease and gave relatively higher yield than the other treatments at Amhara Region, of northern Ethiopia[10].

Host plant resistance

Researchers confirmed that there were no resistant varieties to faba bean gall disease yet in the country even though, there were somewhat tolerant varieties. Improve faba bean varieties i.e Gora and Gachena were recommended as an immediate options of Northern Ethiopia, [10].From 13 improved varieties studied under natural inoculation Degaga and NC-58 were moderately resistant to faba bean gall and showed superior yield in faba bean gall prone areas of Northwestern, Ethiopia [7].

Integrated Disease managements

Foliar spray using Bayleton at rate of 1.5 a.i/ha with variety Adet-Hana, Bulga70 and CS20DK, Nc58 and Kasa provided better yield and the fungicide could be recommended as the best management option for control of faba bean gall disease in south Gondar zone, Northwestern Ethiopia[2].

Conclusion

The above mentioned disease is destructive to the faba bean production in Ethiopia due to the fact that it occurs recently and wide spread in faba bean producing areas. It has been noted that faba bean gall disease reviewed above results in severe economic losses and serves as a potential for country economy. Therefore, this review can provide sufficient information which will lead to development of management practices, and therefore improve faba bean production in the affected areas. Also, exploration and proper disease identification will be important to help to understand more about the gall disease prior to the intervention. Variability within environment conditions should be considered for screening and breeding for resistance, or while testing sensitivity of the pathogen towards different fungicides. An integrated approach using agronomic, nutritive, or fungicide controls should be adopted for an effective disease management. Development of resistant varieties

using conventional as well as biotechnological and molecular biology methods will help in controlling this alarming disease which is still challenges even after several years of its discovery. Studies on epidemiology, diagnosis, yield loss and fungicide application time and frequency to management of faba bean gall disease seem to be quite behind and have to be focused. This review would be helpful to future on faba bean pathological research works in Ethiopia.

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