

## Management of Faba Bean Gall Disease through the use of Host Resistance and Fungicide Foliar Spray in Northwestern Ethiopia

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### Abstract

Most developing countries are hesitated in maximizing tissue culture technology due to the overhead costs involved. Therefore, this research was initiated to evaluate alternative cheap carbon sources and energy in culture media in order to reduce production input costs of sugarcane *in vitro* propagation. The experiment was carried out in completely randomized design (CRD) with 2 × 6 factorial treatment arrangements of genotypes and carbon source in combination. The interaction analysis of genotypes and table sugar concentration significantly influenced *in vitro* sugarcane multiplication. On MS medium with 50 gl<sup>-1</sup> table sugar, B4906 gave the highest (13.42 ± 0.29) shoots, whereas Pr1013 produced a maximum of 7.78 ± 0.19 shoots at 60 gl<sup>-1</sup> table sugar. However, 40 gl<sup>-1</sup> table sugar was optimum to produce usable and separable shoots for further subculture of multiplication. Accordingly results showed that table sugar not only enhanced multiplication but also significantly reduced the production input costs by 94.89% when compared with the analytical grade sucrose.

**Keywords:** Faba bean gall; Bayleton; Severity; Incidence

### Introduction

Faba bean (*Vicia faba* L.) also referred to as broad bean, horse bean and sometimes field bean occupies nearly 3.2 million hectare worldwide [1]. It is believed that the crop was introduced to Ethiopia from the Middle East via Egypt around 5000 B.C., immediately after domestication [2]. In 2003, China leads the world in faba bean production in both area coverage and production followed by Ethiopia, Egypt and Australia [3]. Ethiopia is considered as the secondary center of diversity and also one of the nine major agro-geographical production regions of faba bean [1,2,4,5].

Among pulse crops, faba bean is majorly grown in Ethiopia and leading protein source for the rural people and used to make various traditional dishes. Faba bean is well known by farmers in improving soil fertility by fixing atmospheric nitrogen, and widely use them in rotation with cereals [6]. The crop can be grown for green manure and silage [7]. The majority of the seed produced would be consumed domestically and only a smaller percentage of the crop is delivered to the export market [8]. However, still this small portion of export volume put Ethiopia among the top broad bean exporting countries of the world [9]. Amhara and Oromia are the two major faba bean producing regions. The Amhara region contributes to the highest production (47%) in the country followed by Oromiya region that contributes 39% to national production [10].

Faba bean is an important legume crop and pre-dominantly grown by every individual farmers in Ethiopia. However, there are different faba bean biotic (diseases, insect pests, and weeds) and abiotic production constraints that limit the production and productivity of the crop [6,11]. Among which diseases are the most important biotic factors causing faba bean yield reduction. More than 17 pathogens have been reported so far on faba bean from different parts of the country. Diseases that are economically most important in the major faba bean growing regions including chocolate spot, faba bean rust, and Aschochyta blight [12-14]. In recent years, in additional to the previous common diseases, the crop is threatening by new gall forming disease with typical symptoms of green and sunken on the upper side of the leaf and bulged to the back side of the leaf, and finally develops light brownish color lesion, chlorotic galls, and progressively broaden to become circular or elliptical uneven spots [8,15]. The faba bean gall

caused yield loss up to 30-100% [16]. These data showed that faba bean gall is the most destructive disease that causes total yield loss. The disease affects leaves and stems and it affects large areas in the country where faba bean is cultivated and cause considerable losses in quality and quantity of the products [8]. The disease was highly expanding and distributing violently in the country from year to year.

Even though the disease is disseminated at violent rate, there is no management options under took to control the disease. Hence, this needs more attention to find solution for farmers to manage the disease and sustain their life with producing faba bean crops. Therefore, this study was conducted to manage faba bean gall disease through the integrated use of host resistance and fungicide foliar spray.

### Material and Methods

#### Site description

The experiment was conducted at Farta and Tach gaynt in farmers' field during 2014 main cropping season. Farta and Tach gaynt are found an altitude of 2500 and 2880 above sea level in Amhara region, South Gondar Zone, respectively. The average annual rainfall of Farta is about 1750 mm and Tach gaynt is 925 mm. The average annual temperatures of Farta and Tach gaynt are 17°C and 18.5°C, respectively. The major soil type of Farta and Tach gaynt are clay loam and clay loam, loamy sand, respectively.

#### Experimental design and procedures

The field experiment was conducted within two sites at Farta and Tach gaynt in farmers, fields during 2014 main cropping season.

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The treatments to be evaluated were 14 faba bean varieties, released (CS20DK, NC58, Kasa, Bulga70, Mesay, Tesfa, Degaga, Adet-Hana, Moti, Gebelecho, Obse, Dosha, Tumsa), and local check. The varieties to be evaluated were collected from Holeta and Adet Agricultural Research Centers. The treatments were arranged in split plot design with three replications. The experiment has 14 main plots and two subplots i.e protected with fungicide and unprotected. The size of main plot was 4 m length  $\times$  3.8 m width with having 0.8 m spacing between main plots and the sub-plot size was 4 m length  $\times$  1.4 m with having 4 seedling rows (with 2 net rows) and spacing between blocks, was 1 m and spacing between plots, rows and plants was 0.6 m and 0.4 m, 10 cm respectively. The protected plots were sprayed using triadimefon (Bayleton<sup>®</sup> WP 25) systemic fungicide at the rate of 0.125 kg a.i/ha for all varieties starting from 3 weeks after sowing in 15 days interval. 15 g of Bayleton was diluted within 5 liter of water to spray the experimental plots. All necessary agronomic practices were done as required.

### Data collection

**Crop data:** The grain yield of faba bean was measured at maturity, from the central rows of each plot by harvesting the plants manually. Seed yield per plot was measured using a sensitive balance and then adjusted to 9% moisture content, and yield per plot was converted into kg/ ha.

**Disease assessment:** Faba bean gall incidence and severity assessments were started as soon as the first disease symptoms occurred in every 10 days interval at both locations. Using 10 randomly pre-tagged faba bean plants in the two central rows, severity was rated using standard disease scales of 0-9 [17,18]. The following infection levels on the scale were used: 0, no visible infection on leaves; 1, a few dot-like accounting for less than 5% of total leaf area; 3-4, discrete galls less than 2 mm in diameter, accounting for 6-25% of leaf area; 5, numerous scattered galls with a few linkages, diameter 3-5 mm, on 26-50% of leaf area with a little defoliation; 6, confluent galls formation accounting for 51-75% of leaf/stem area, mild gall formation, half the leaves dead or defoliated; 7, complete destruction of the larger leaves, galls covering more than 76% of leaf area, abundant gall formation; 8, 80% of the defoliated and plants darkened and dead; 9, disease covering more than 80% of the foliar tissue heavy defoliation and plants darkened and dead. Diseases incidence was calculated using the following formula.

$$\text{Disease incidence} = \frac{\text{Number of disease plants}}{\text{Total number of}} \times 100$$

Disease development data were rated using 1-9 rating scale and then converted in to percentage severity index using the formula.

$$\text{PSI} = \frac{\text{Sum of numerical ratings} \times 100}{\text{Number of plants scored} \times \text{maximum score on scale}}$$

The area under the disease progress curve (AUDPC) was calculated from percentage severity index using the following formula

$$\text{AUDPC} = \sum_{i=1}^n [0.5(X_i + x_{i+1})(t_{i+1} - t_i)]$$

Where:  $X_i$  = the cumulative disease severity expressed as a proportion at the  $i^{\text{th}}$  observation

$t_i$  = time of the  $i^{\text{th}}$  assessment,  $n$  = the total number of observation

### Data analysis

The collected data from the two experimental sites were subjected to ANOVA to determine the treatment effects. AUDPC for each

treatment were evaluated from disease severity values. The severity grades were converted into percentage severity index using the formula stated above. Least significant difference (LSD) value was used to separate the treatment means. All diseased and agronomic data were analyzed by using SAS version 9.1.3 statistical software [19].

## Results and Discussion

### Incidence of faba bean gall disease

Percentage of disease incidence was showed significant difference ( $P < 0.05$ ) among faba bean varieties at both locations at all dates of assessment. Highly significant difference ( $P < 0.01$ ) was observed on incidence of faba bean gall disease between sprayed and unsprayed plot at both locations at all dates of assessment. Higher disease incidence was recorded from variety Adet-Hana at both initial and final dates of assessment at Farta. Lower disease incidence was scored from variety Tumsa at initial and Degaga and Nc58 at final date of assessment at Farta (Table 1). At Tach gaynt, the disease incidence was higher on variety Bulga70 and Adet-Hana at both initial and final dates of assessment. While lower mean disease incidence was scored from variety Tumsa at both initial and final dates of assessment (Table 1).

The combined use of varieties and Bayleton foliar spray was showed highly significant difference ( $P < 0.01$ ) at Farta and significant difference ( $P < 0.05$ ) at Tach gaynt on disease incidence at the initial and final dates of assessment (Table 2). Higher disease incidence was scored from unsprayed plots of variety Bulga70, Adet-Hana, Dosha, CS20DK and Gebelecho at the final date (66 days after sowing) of disease assessment at Farta. However, lower disease incidence was recorded from unsprayed plots of variety Nc58 and Degaga. At Tach gaynt, the disease incidence was lower on unsprayed plots of variety Tumsa and Moti at final date of assessment. While the disease incidence was higher on unsprayed plots of variety Bulga70, Kasa, Local check, Adet-Hana, Degaga and Mesay at the final assessment. The disease incidence was completely zero in sprayed plots of all faba bean varieties except Adet-Hana, Dosha, Moti and Tesfa at Farta and Adet-Hana, Bulga70, Gebelecho at Tach gaynt at final date of assessment (Table 2). The interaction of variety with Bayleton foliar spray reduced the percentage of disease incidence by 90% and 83.3% on sprayed plot of variety Adet-Hana over unsprayed plot of this variety at Farta and Tach gaynt, respectively, at the final date of assessment. Similarly, Bayleton foliar spray lowers the disease incidence by 80% and 100% on sprayed plot of variety Bulga70 over unsprayed plot of this variety at Farta and Tach gaynt, in that order, at the final date of assessment. The disease incidence was reached 100% on variety Bulga70, Kasa and Local check on unsprayed plots at Tach gaynt at the final date of assessment. This result showed that all the assessed plants of these varieties were infected by the faba bean gall disease. From three surveyed regions by the maximum mean incidence of 43.4% was recorded in South Gondar in Amhara region [8]. The study by Teklay et al. [16] in Tigray showed that the incidence range of the disease varied from 5-100%. In unsprayed plot, mean faba bean gall incidence ranged from 50-93.3% and 56.7-100% at Farta and Tach gaynt, respectively at final date of assessment. At both locations all faba bean varieties were infected by the newly emerged faba bean gall disease. This agreement with the study by Teklay et al. [16] and Hailu et al. [8] who are reported that all improved and local faba bean varieties affected by the diseases indifferently. The prevalence of the new gall disease was in the range of 0 and 100% [8,16].

### Severity of faba bean gall disease

Percentage severity index (PSI) calculated from disease severity assessed five times at both locations. Percent severity index was higher

Varieties	Farta				Tach gaynt			
	Incidence (%)DAS		PSI (%) DAS		Incidence (%) DAS		PSI (%) DAS	
	Initial (26)	Final (66)	Initial (26)	Final (66)	Initial (28)	Final (68)	Initial (28)	Final (68)
Adet-Hana	75.0	48.3	17.0	30.7	70.0	51.7	21.5	22.8
Bulga 70	58.3	40.0	14.4	28.0	71.7	55.0	18.2	28.5
CS20Dk	41.7	35.0	6.7	23.3	70.0	46.7	19.8	20.6
Degaga	28.3	25.0	4.1	8.3	53.3	46.7	11.0	17.4
Dosha	33.3	41.7	7.6	19.8	48.3	43.3	12.0	13.7
Gebelecho	43.3	35.0	10.6	15.0	50.0	38.3	15.4	13.7
Kasa	30.0	26.6	1.7	1.3	65.0	50.0	22.6	24.6
Mesay	23.3	28.3	0.6	5.6	63.3	48.3	19.1	22.4
Moti	36.7	35.0	6.9	19.6	43.3	33.3	11.7	13.7
Nc58	26.7	25.0	5.9	13.7	61.7	43.3	20.2	25.2
Obse	30.0	31.7	3.3	6.1	63.3	38.3	14.1	12.4
Tesfa	25.0	28.3	3.7	17.0	41.7	38.3	7.2	13.7
Tumsa	15.0	28.3	1.9	8.3	30.0	28.3	5.9	10.6
Local check	30.0	30.0	1.3	5.2	63.3	50.0	15.9	18.0
CV (%)	26.34	26.36	28.20	29.56	26.90	22.20	18.71	17.61
LSD (5%)	25.59	15.64	12.73	25.44	31.79	12.67	12.83	8.30
<b>Foliar spray</b>								
Sprayed	26.67	1.19	6.03	0.11	44.76	2.14	15.93	0.13
Unsprayed	44.29	64.29	6.19	28.76	68.81	85.24	14.71	36.32
CV (%)	24.39	28.88	29.96	27.84	28.43	22.04	14.14	18.10
LSD (5%)	11.55	5.12	NS	24.08	13.55	18.47	NS	5.92

PSI=percentage of severity index, DAS=days after sowing, means with in a column followed by the same letter were not significantly different, CV=Coefficient of variation, LSD=Least Significant Difference.

**Table 1:** Effect of faba bean varieties on percentage severity index and incidence of faba bean gall disease at Farta and Tach gaynt under field condition in 2014 cropping season.

in unsprayed plot as compared to sprayed plot at both locations (Table 3). Percentage severity index was showed significant difference ( $P<0.05$ ) among faba bean varieties at both locations at all dates of assessment. There was also a significant variation ( $P<0.05$ ) between sprayed and unsprayed plot on percentage severity index of the disease at both locations at all dates of assessment except at initial (26 and 28 days after sowing).

Higher mean severity of faba bean gall was recorded from variety Adet-Hana at both initial and final dates of assessment at Farta. Whereas the mean severity was lower on variety Kasa at both initial and final date of assessment (Table 1). At Tach gaynt, lower mean severity was scored from variety Tumsa at both initial and final dates of assessment. Faba bean gall disease severity was higher on variety Kasa at 28 days after sowing (DAS) and Bulga 70 at 68 DAS disease assessment (Table 1).

The integration of varieties with fungicide spray by Bayleton was showed a significant difference ( $P<0.05$ ) on percentage severity index (PSI) of faba bean gall all dates of assessment at both sites. The PSI of faba bean gall was reached zero on sprayed plot of variety Degaga, NC58, Obse, Tumsa and Local check at 46 and 48 DAS at Farta and Tach gaynt, respectively. Whereas the mean value of unsprayed plot of these varieties was showed increasing PSI of faba bean gall from the initial to the final date of disease assessment. The percentage severity index of faba bean gall was significantly reduced on sprayed plot than unsprayed at both locations. From unsprayed plot, PSI of faba bean gall was higher on variety Adet -Hana and Bulga70 while lower value of PSI was scored from variety Kasa and Local check at Farta at final date of assessment (Table 3). The use of Bayleton foliar spray reduced PSI of faba bean gall by 60.7%, 55.9% and 46.7% on sprayed Adet Hana, Bulga70 and CS20DK varieties in their order over unsprayed plot of

these varieties. Similarly, Bayleton foliar spray in combination with variety Moti, Tesfa and Gebelecho decreased PSI of faba bean gall by 38.5%, 33.3% and 30.0% in that order over unsprayed plot of these varieties at final date of severity assessment at Farta. At Tach gaynt, Bayleton foliar spray with variety was lower the PSI of faba bean gall on sprayed variety of Bulga70, Nc58, and Kasa by 55.6%, 50.4% and 45.2%, respectively over unsprayed plot of these varieties at final date of assessment. In addition to these, foliar application of Bayleton on Mesay, Adet Hana and CS20DK varieties was reduced the PSI of faba bean gall by 44.8%, 44.8% and 41.1%, in that order over the unsprayed plot of these varieties at the final date of severity record. The maximum mean severity of 57.5% was observed in Awi zone followed by the study area with mean severity of 40.7% [8]. Lower mean value of PSI of faba bean gall was scored from unsprayed plot of Tumsa and Obse at the final date of assessment at Tach gaynt. The disease was more severe in study area as compared to other regions [8]. The plot subjected to foliar spray was reduced the faba bean gall diseases severity in all varieties including local check at all dates of assessment as compare to unsprayed plot at both sites. All faba bean varieties were significantly affected by the disease. This result coincides with Dereje et al., Teklay et al., Hailu et al. [8,15,16]. Generally, Bayleton foliar spray on faba bean varieties has significant effect in reduction of PSI of faba bean gall disease at both locations.

#### AUDPC (Area under disease progress curve)

The integration of varieties with fungicide spray by Bayleton was showed significant difference ( $P<0.05$ ) on AUDPC of faba bean gall disease at both sites. The maximum mean AUDPC of the disease was scored on variety Adet-Hana and Bulga 70 on unsprayed plot at Farta and Tach gaynt in their order. Lower value of AUDPC was recorded from variety Local check and Tumsa on unsprayed plot at Farta and

Variety X Foliar spray		Disease incidence at Farta DAS (%)		Disease incidence at Tach gaynt DAS (%)	
		Initial (26)	Final (66)	Initial (28)	Final (68)
Adet-Hana	Sprayed	73.3	3.3	53.3	10.0
	Unsprayed	76.7	93.3	86.7	93.3
Bulga 70	Sprayed	53.3	0	53.3	10.0
	Unsprayed	63.3	80.0	90.0	100.0
CS20Dk	Sprayed	33.3	0	60.0	0
	Unsprayed	50.0	70.0	80.0	93.3
Degaga	Sprayed	26.7	0	40.0	0
	Unsprayed	30.0	50.0	66.7	93.3
Dosha	Sprayed	23.3	6.7	30.0	0
	Unsprayed	43.3	76.7	66.7	83.3
Gebelecho	Sprayed	26.7	0	43.3	6.7
	Unsprayed	60.0	70.0	56.7	70.0
Kasa	Sprayed	23.3	0	56.7	0
	Unsprayed	36.7	53.3	73.3	100.0
Mesay	Sprayed	10.0	0	50.0	0
	Unsprayed	36.7	56.7	76.7	96.7
Moti	Sprayed	30.0	3.3	50.0	0
	Unsprayed	43.3	66.7	36.7	66.7
Nc58	Sprayed	20.0	0	50.0	0
	Unsprayed	33.3	50.0	73.3	86.7
Obse	Sprayed	16.7	0	50.0	0
	Unsprayed	43.3	63.3	76.7	76.7
Tesfa	Sprayed	13.3	3.3	33.3	0
	Unsprayed	36.7	53.3	50.0	76.7
Tumsa	Sprayed	3.33	0	16.7	0
	Unsprayed	26.7	56.6	43.3	56.7
Local check	Sprayed	20.0	0	40.0	0
	Unsprayed	40.0	60.0	86.7	100.0
CV (%)		24.76	27.85	20.99	23.69
LSD (5%)		31.77	20.27	38.07	16.93

PSI=percentage of severity index, DAS=days after sowing, CV=Coefficient of variation, LSD=Least Significant Difference.

**Table 2:** Effect of faba bean varieties with fungicide foliar spray on incidence of faba bean gall disease at Farta and Tach gaynt under field condition in 2014 cropping season.

Tach gaynt respectively. Higher mean AUDPC faba bean gall was scored from unsprayed plots than sprayed plots (Table 3). The area under disease progress curve (AUDPC) is a very convenient summary of plant disease epidemics that incorporates into initial intensity, the rate parameter, and the duration of the epidemic which determines final disease intensity [20]. The AUDPC was used to summarize the epidemics of the disease in the different varieties evaluated during this experiment.

### Seed yield of faba bean

Faba bean varieties with foliar spray were showed significant variation ( $P < 0.05$ ) on seed yield at both locations. At Farta, higher yield was obtained from sprayed plot of variety Adet-Hana and CS20DK while lower yield was scored from sprayed plot of variety Mesay and Obse. From unsprayed plot, higher yield per hectare was scored from variety CS20DK and lower value was obtained from variety Moti at Farta (Table 4). At Tach gaynt, the highest yield was scored from sprayed plot of variety Kasa (1441.7 kg/ha) and Nc58 (1333.3 kg/ha) where as lower yield per hectare was obtained from sprayed plot of variety of Tesfa (558.3 kg/ha). From unsprayed plot, lower yield was recorded from variety Gebelecho, Tumsa, Moti and Dosha at Tach gaynt. Maximum mean yield was gained from unsprayed plot of variety Local check. The epidemic conditions of the disease have significant implication on the production of faba bean and on the country's Economy [8]. The disease reduced the yield by 1116.7 kg/ha, 700 kg/

ha, 541.6 kg/ha on variety Adet-Hana, Degaga and Gebelecho in their order at Farta. The faba bean gall caused yield loss up to 30-100% [16]. At Tach gaynt, it reduced the yield by 123.4 kg/ha, 291.7 kg/ha, 166.6 kg/ha on the above varieties in their previous order. In this study, the yield of all varieties reduced on unsprayed plots at both locations. Past surveyed study explained that faba bean production in Ethiopia is highly challenged by new faba bean gall forming disease [8].

### Conclusion

Faba bean gall disease is the newly emerging and aggressively spread disease in the country and cause 100% yield loss in susceptible faba bean varieties. The combined use of Bayleton foliar spray with variety significantly reduced PSI of faba bean gall by 60.74% and 55.93% on sprayed Adet Hana and Bulga70 varieties in their order over unsprayed plot of these varieties at Farta. At Tach gaynt, the interaction effect was lower the PSI of faba bean gall on sprayed variety of Bulga70, Nc58, and Kasa by 55.56% and 50.37%, respectively over unsprayed plot of these varieties at final date of assessment. The disease reduced the yield by 1116.7 kg/ha and 123.4 kg/ha on unsprayed plot of variety Adet-Hana at Farta and Tach gaynt in their order. It also decreased the yield by 700 kg/ha and 291.7 kg/ha on unsprayed plot of variety Degaga respectively at Farta and Tach gaynt.

The investigation showed that all faba bean varieties were infected by the newly emerged faba bean gall disease at both locations. The

Variety X Foliar spray		Location					
		Farta			Tach gaynt		
		PSI DAS (%)		AUDPC (% days)	PSI DAS (%)		AUDPC (% days)
		Initial (26 )	Final (66)		Initial (28)	Final ( 68)	
Adet-Hana	Sprayed	19.3	0.4	74.1	21.1	0.4	58.5
	Unsprayed	14.8	61.1	332.6	21.9	45.2	321.5
Bulga 70	Sprayed	17.8	0	74.1	18.9	0.7	54.1
	Unsprayed	11.1	55.9	307.4	17.4	56.3	368.9
CS20Dk	Sprayed	7.8	0	33.3	18.5	0	50.4
	Unsprayed	5.6	46.7	209.6	21.1	41.1	287.4
Degaga	Sprayed	4.1	0	9.6	11.9	0	29.6
	Unsprayed	4.1	16.7	93.3	10.0	34.8	213.3
Dosha	Sprayed	5.2	0.4	32.6	12.6	0.4	32.6
	Unsprayed	10.0	39.3	225.9	11.5	27.0	203.0
Gebelecho	Sprayed	7.4	0	29.6	14.1	0.4	44.4
	Unsprayed	13.7	30.0	205.2	16.7	27.0	210.4
Kasa	Sprayed	3.0	0	14.8	24.4	0	46.6
	Unsprayed	0.4	2.6	15.6	20.7	45.2	345.2
Mesay	Sprayed	0	0	0	21.1	0	44.8
	Unsprayed	1.1	11.1	67.4	17.0	44.8	304.4
Moti	Sprayed	4.4	0.4	19.3	12.6	0	39.3
	Unsprayed	9.3	38.9	196.3	10.7	27.4	214.1
Nc58	Sprayed	5.6	0	14.8	21.5	0.0	54.8
	Unsprayed	6.3	27.4	140.7	18.9	50.4	338.5
Obse	Sprayed	2.6	0	5.9	14.8	0	43.0
	Unsprayed	4.1	12.2	105.2	13.3	24.8	181.5
Tesfa	Sprayed	4.8	0.4	20.0	5.2	0	16.3
	Unsprayed	2.6	33.7	111.6	9.3	27.4	168.9
Tumsa	Sprayed	1.1	0	3.7	7.0	0	24.4
	Unsprayed	2.6	16.7	60.7	4.8	21.1	139.3
Local check	Sprayed	1.1	0	4.4	19.3	0.0	45.2
	Unsprayed	1.5	10.4	50.4	12.6	35.9	260.0
CV (%)		29.07	30.32	28.99	19.90	17.86	11.46
LSD (5%)		14	35.48	199.62	15.01	11.29	100.27

PSI=percentage of severity index, DAS=days after sowing, AUDPC=area under disease progress curve, CV=Coefficient of variation, LSD=Least Significant Difference.

**Table 3:** Effect of faba bean varieties with fungicide foliar spray on percentage severity index and AUDPC at Farta and Tach gaynt under field condition in 2014 cropping season.

Variety X Foliar spray		Yield (kg/ha) at Farta	Yield (kg/ha) Tach gaynt
Adet-Hana	Sprayed	1900.0	1106.7
	Unsprayed	783.3	983.3
Bulga 70	Sprayed	900	1291.7
	Unsprayed	616.7	1000
CS20Dk	Sprayed	1766.7	1225
	Unsprayed	1166.7	900
Degaga	Sprayed	1466.7	1025
	Unsprayed	766.7	733.3
Dosha	Sprayed	1458.3	658.3
	Unsprayed	841.7	408.3
Gebelecho	Sprayed	1133.3	483.3
	Unsprayed	591.7	316.7
Kasa	Sprayed	733.3	1441.7
	Unsprayed	483.3	1033.3
Mesay	Sprayed	516.7	908.3
	Unsprayed	491.7	725
Moti	Sprayed	583.3	541.7
	Unsprayed	225	400
Nc 58	Sprayed	775	1333.3
	Unsprayed	716.7	1283.3

Obse	Sprayed	550	683.3
	Unsprayed	508.3	550
Tesfa	Sprayed	1008.3	558.3
	Unsprayed	583.3	425
Tumsa	Sprayed	966.7	633.3
	Unsprayed	475.0	391.7
Local check	Sprayed	600.0	1316.7
	Unsprayed	500.0	1308.3
CV (%)		18.35	10.44
LSD (5%)		787.64	970.11

CV=Coefficient of variation, LSD=Least Significant Difference.

**Table 4:** Effect of faba bean varieties with fungicide foliar spray on yield of faba bean at Farta and Tach gaynt under field condition in 2014 cropping season.

plot subjected to foliar spray was reduced the faba bean gall diseases severity in all varieties including local check at all dates of assessment as compare to unsprayed plot at both sites. In general, Bayleton foliar spray on faba bean varieties has a significant effect in reduction of the severity of faba bean gall disease at both locations. Therefore, 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.

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