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Screening of Faba Bean (Vicia faba)Varieties Against Faba bean Gall Diseases (Olpidium viciae*)* in East Gojjam Zone, Ethiopia

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Abstract
Faba bean (ViciaFabae L.) is an important legume crops grown in different agro ecological zone in Ethiopia. It has a vital role in the Ethiopia national dietary and is consumed in various forms. However, the average yield of its production under small-holder farmers is very low due to biotic and a-biotic factors. Faba bean gall (Olpidiumviciae) disease is one of the newly emerging disease threateningfaba bean production and productivity in small scale farmers in the study site. Thus, the study was conducted to evaluate the reaction of fababean varieties against faba bean gall disease at three main fababean production woredas farmers field during 2015 main cropping season. The field experiment consisted of seventeen fababean varieties (sixteen released and one local check). The experiment was laid out in Randomized Complete Block Design (RCBD) with three replication. The evaluated seventeen varieties varied significantly ($p<0.001$) in disease severity, AUDPC , yield and yield components. The tested varieties had varying reactions to the disease, on the basis of which two groups were identified, viz. Resistant (fourteen varieties) and moderately Resistant (three varieties). The highest and least percent disease severityindex and AUDPC was recorded from local check and Dosha varieties respectively in all locations. Yield and yield parameters were also significantly ($P<0.001$) different in all locations. In general Dosha, Tumsa, Hachalu and Wolki varieties were high yielder and resistant to faba bean gall in all study sites compared with other varieties. In the future, resistance and high yielder varieties combination with other alternative management options research will be conducted in the potential faba bean growing areas in Ethiopia.
Keywords: Faba bean gall disease, disease severity, AUDPC, Dosha, Tumsa, Wolki

1. 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 (Torres *et al*., 2006).The production of Faba bean in the world is concentrated in nine major agro-ecological regionssuch as, Mediterranean Basin, Nile Valley, Ethiopia, Central Asia, East Asia, Oceania, Latin America, Northern Europe and North America (Bond *et al.,* 1985). In 2003, the worldwide production was 2.6 million metric tons (Mt); China leads the world in faba bean production in both area coverage and production. Other major production areas are Ethiopia (0.37 million ha, 0.45 Mt), Egypt (0.14 million ha, 0.44 Mt) and Australia (0.16 million ha, 0.27 Mt)). Ethiopia is the world's second largest producer of Faba bean next to China, its share is only 6.96% of world production and 40.5% within Africa (FOASTAT, 2016).

In East Africa, Ethiopia is the major consumer and producer of Faba bean. Area under faba bean grains has increased from 348,400 ha in 1993-95 to 471,700 ha in 2011-14 with yield increase from 1 t/ha to 1.9 t/ha respectively. Productivity of improved varieties is very high (3.5 t/ha) compared to the country average yield (1.8 t/ha). Moreover, Ethiopia exported 0.04 Mt of faba bean with total 25 million USD in 2013 (FAOSTAT, 2016).In Ethiopia, faba bean is the leading protein source for the rural people and used to make various traditional dishes. Moreover, it provides large cash for producers and foreign exchange for the country (Tafere *et al*.,2012).However, the average yield of faba bean under small-holder farmers is not more than 1.6 t ha-1 (CSA; 2013), despite the availability of high yielding varieties (> 2 t/ha) (MoA. 2011).The low productivity of the crop is attributed to susceptibility to manybiotic and abiotic stresses (Sahile *et al*; 2008 and Mussa *et al*; 2008). From the biotic category, diseases are important factors limiting the production of food-legume crops as a whole and faba bean specifically in Ethiopia (Nigussie *et al* 2008). More diseases are affecting faba bean, but only a few of them have either major or intermediate economic significance. Among these, fungi are the largest and perhaps the most important groups affecting all parts of the plant at all stages of growth great importance to faba bean (Nigussie *et al* 2008). The newly emerging disease known as "faba bean gall" incited by the pathogen *Olpidium viciae* Kusano infection leads to complete crop failure over wide areas within short period of time and aggravates the diminution of yield to maximum nationwide. Moreover, the crops threatened by this disease showed the symptom 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 (Dereje *et al*; 2012). Currently, different attempts have been made for control of complex fababean disease including fungicide sprays. But due to high cost of fungicides, social and health related and environmental impacts it is better to seek other alternative means of disease control methods. Thus, the use of resistant cultivars is widely recognized as the safest, most economical and most effective method for protecting crops from gall disease. However, in Ethiopia particularly in Amhara region scanty information is available or no attempts have beenmade in the past to identify useful resistance in fababean genotypes against the faba bean gall diseases. Therefore, the present study was designed to evaluate different fababean varieties against gall diseases at farmer fields in major fababean growing area of East Gojjam zone Ethiopia.

2. Material and Methods

2.1. Description of the Study Areas

The experiment was conducted during 2015 main cropping seasonin three Woredas in east Gojjam Zone i.e Debay Telatgen (Asendabo keble) , Gozamen (Enerat Kebele) and Senan (Gedamawit kebele). Enerata and Gedamawit kebele is found far from 5 km and 30 km north of Debre Markos Town respectively. Asendabo kebele is located 60km from East South Direction of Debre Markos Town. Geographically Gozamen Woreda is found an attitude of 2450 meter above sea level. Its annual maximum and minimum temperature and rain fall is 25^0c-11^0c and 1628mm respectively Whereas, Senan and Debay Telatgen Woreda are found an altitude of 3000 and 2400 meter above sea level respectively and annual maximum and minimum rain fall is 1200-900mmand 800-1050 mm respectively. Annual maximum and minimum temperature of Debay Telatgen woreda is 10-15 ^{o}c(Gashe *et al*, 2017).

2.2. Treatments and Experimental Design

The experiment consist of 16 faba bean varieties with one local check a total of 17 varieties. The sixteen faba bean varieties were collected from Holetta Agricultural Research Center Ethiopia and evaluated for their reaction to faba bean gall disease under natural conditions. Whereas, the local check was collected from each kebele at the time of planting. The experiment was laidout in a randomized complete block design (RCBD) with three replications. Three local check were used in one experimental fields in which each block has one local check. To reduce the inter plot effect the spacing between plots and blocks were adjusted at 1meter and 1.5 meter respectively. There were five rows per plot and intera and inter plot spacing was 0.1meter and 0.4 meter respectively. The size of each plot was 2 meter long and 2 meter wide and total area was 4 m^2. Disease, yield and yield component data were taken from 3 central rows.At the time of planting all plots received a basal application of DAP 100kg/ha. The rest agronomic practices were applied as the recommended package of faba bean crop.

2.3. Data collected

2.3.1. Disease Data

- **Disease severity:** The severity of the disease was assessed at ten days interval from **twelve** faba bean plants per plot four plants per row were randomly tagged for data collection. The disease severity index was recorded using a 0–9 scale to determine area of affected plant part according to Ding *et al.* (1993)
- $$\text{Percent severity Index (\% si)} = 100\,\frac{(V+3w+5x+7y+9z)}{9\,(\text{highest rating value})\,(v+w+x+y+z)}$$

  Where, v= number of plants in class 1, w= number of plants in class 3, x= number of plants in class 5, y= number of plants in class 9, z = number of plants in class 9.

  The response of the each variety was expressed as the PSI values according to Ding *et al*. (1993). Six resistance levels was used: HR (highly Resistant), PSI ranging between 0 and 2.0; R (Resistant), PSI =2.1–15.0; MR (Moderately Resistant), PSI =15.1–40.0; MS (Moderately Susceptible), PSI =40.1–60.0; S (susceptible), PSI =60.1–80.0; HS (Highly Susceptible), PSI =80.1–100.
- The area under the disease progress curve (AUDPC) was calculated from disease severity index as the following formula.

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

Where: Xi=the cumulative disease severity expressed as a proportion at the i^{th} observation
t_i= time of the i^{th} assessment, n= the total number of observation.

2.3.2. Crop Data

Plant height, number of pods per plant and number of seeds per pod were determined from the three central rows of 12pre-tagged plants and seed yield per plot was recorded from three middle harvested rows, and yield per pot

were converted in to yield quintal per hectare.

2.3.3. Data analysis

The collected data were subjected to ANOVA to determine the treatment effects. AUDPC for each treatment was evaluated from disease severity values. The severity grades were converted into percentage severity index using the formula stated above. Duncan's multiple range (DMRT) value was used to separate the treatment means.

3. Results and Discussion

3.1. Result

3.1.1. Faba bean Gall disease development on faba bean varieties:

Faba bean gall disease development is here presented as disease severity indexes. After analysis, the reaction was found to fall into two resistance levels, i.e resistant and moderately resistance(Table 2). The difference in reaction among varieties might be due to the genetic makeup of the varieties and disease intensity level across locations. The difference reaction among varieties might be came due to the genetic makeup of the varieties the environmental conditions and disease intensity level across locations.

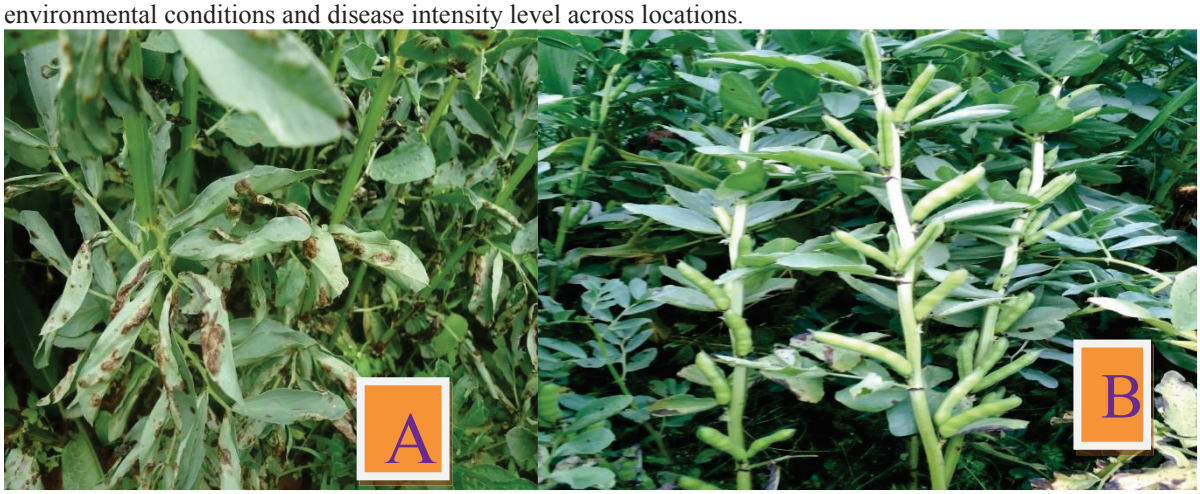

Figure 1:- Abnormal Growth of Faba bean leaf due to faba bean gall disease (A) and resistant Faba bean varieties with full potential of pod setting (B)

3.1.2. Faba bean gall Disease percent severity index

The result of the present study indicated that the reaction of 16 faba been varieties and one local check to faba bean gall disease was significantly ($P<0.001$) different at Gozamen, Senan and Debay Telatgen woredas. In Gozamen woreda experimental field the average mean least faba bean gall percent severityindex onfaba beanwas recorded from Dosha, Tumsa, Hachalu and Walki varieties with 3.52%, 10.85%,12.89% and 15.91.32% respectively. On the other hand, the highest average mean faba bean gall percent severity index in Gozamen woreda experimental field was revealed from local check, NC-58, Tesfa and Gebelecho varieties with 21.52%, 20.74%, 18.42% and 17.52% respectively (Table 2). Similarly, in Senan and Debay Telatgen woreda experimental field the average mean least faba bean gall percent severity index was recorded from Dosha (3.06% and 3.32), Tumsa (3.16 and4.03%), Hachalu (3.89% and 5.71%) and Walki (7.26% and 5.27%) respectively (Table 2). In the contrary, in Senan and Debay Telatgen Woreda experimental field the highest mean average percent severity index was found from Local check (29.87% and 16.86%), Gebelecho (20.97% and 11.73%), CS20DK 918.89% and 11.72%) and Bulga70 (15.06% and 11.72%) respectively (Table 2). In the three experimental fields the least and highest combined faba bean gall percent severity index was encountered from Dosha and local check varieties with 3.3% and 22.75% respectively (Table 2). Further compared with the locations wise, the highest and least percent severity index was observed in senan Woreda experimental field. Moreover, the result revealed that there were no statically faba bean gallpercent severity index mean difference among Adet Hana (16.09%) Walki (15.91% and CS20DK(15.91%), and between Moti (16.62%) and Degaga (16.62%) varieties in Gozamen woreda experimental field. Likewise, there were no faba bean gall percent severity index mean difference among Bulga70(15.06%), Tesfa (15.37%) and Degaga (14.74%) and among CS20DK (11.72%), Gebelecho (11.73%) and Bulga70 (11.72%) in Senan and Debay Telatgen woreda experimental fields respectively (Table 2).

3.1.3. Area Under Disease Progress Curve (AUDPC)

The Area Under Disease Progress Curve (AUDPC) is a very convenient summary of plant disease epidemics that incorporates the initial intensity, the rate parameter and the duration of the epidemic which determines the final disease intensity (Madden *et al*., 2008).

The result showed that there were highly significant difference ($P<0.001$) among varieties in their AUDPC values within the experimental field and across location (Table 2). The highest AUDPC (351.94) wasobtained

from the local check and the second highest AUDPC (348.18%) was estimated from the variety Gebelecho, whereas, the lowest AUDPC (137.97%) was calculated from Dosha variety in Gozamen woreda experimental fields (Table 2). This trend also observed in Senan and Debay Telatgen woreda experimental fields. The present study revealed that there were no AUDPC value significant differenceamong NC-58 (323.19%), Messay (327.15%), Gora (329.78%) and Moti (328.2%) in Gozamen woreda experimental field (Table 2). Likewise, there were no significant difference in their AUDPC values between NC-58 (165.57%) and tesfa 165.10%) varieties in Senan woreda (Table 2). The AUDPC value of NC-58 (133.37), Kassa (135.05%) and Tesfa (133.37%) were not significantly different in Debay Telatgen Woreda. Furthermore, compared with location wise the highest AUDPC value was found from the local check in Gozamen woreda experimental field and the least AUDPC value was calculated from variety Dosha at Debay Telatgen woreda experimental field (Table 2). Generally across the location Dosha, Tumsa, Hachalu and Walki varieties comparably showed lower AUDPC value and categorized as Resistance (Table 2)

Table 2:- Level of mean disease severity index (DSI), and area under disease progress curve (AUDPC) of faba bean gall, on Fababean varieties during 2015 main cropping season

Variety name	Percent severity index mean				Area Under Disease Progress Curve (AUDPC%)			
	Gozamen	Senan	Debay Telatgen	combined Mean	Gozamen	Senan	Debay Telatgen	Disease Reaction
Adet hana	16.09^{d}	10.45^{f}	6.1^{hi}	10.88	320.15b^{c}	123.95^{g}	134.38^{e}	R
Gebelecho	17.52^{bc}	20.97^{b}	11.73^{b}	16.74	348.18^{a}	181.61^{b}	189.73^{b}	MR
Tesfa	18.42^{b}	15.37^{d}	10.12^{cd}	14.64	294.95^{ef}	165.1^{d}	133.37^{e}	R
Walki	15.91^{d}	7.26^{i}	5.71^{hi}	9.63	239.63^{h}	82.46^{l}	94.99^{h}	R
Dosha	3.52^{g}	3.06^{j}	3.32^{k}	3.30	137.97^{i}	72.88^{m}	49.38^{i}	R
Obse	16.88^{cd}	9.21^{gh}	6.89^{gh}	10.99	284.03^{g}	114.29^{h}	151.25^{d}	R
Bulga70	16.48^{cd}	15.06^{d}	11.72^{b}	14.42	291.00^{fg}	98.23^{j}	123.41^{f}	R
NC-58	20.74^{a}	8.55^{h}	10.8^{bc}	13.36	323.19^{b}	165.57^{d}	133.37^{e}	R
Kasa	16.89^{cd}	9.89^{fg}	7.63^{fg}	11.47	305.91^{d}	92.24^{k}	135.05^{e}	R
Mesay	17.33^{c}	8.08^{hi}	9.15^{de}	11.52	327.15^{b}	106.053^{i}	122.93^{f}	R
Gora	17.40^{bc}	8.54^{h}	8.58^{ef}	11.51	329.78^{b}	172.38^{c}	167.39^{c}	R
Local check	21.52^{a}	29.87^{a}	16.86^{a}	22.75	351.94^{a}	261.56^{a}	218.69^{a}	MR
CS20DK	15.91^{d}	18.89^{c}	11.72^{b}	15.51	311.30^{cd}	147.07^{e}	168.37^{c}	MR
Moti	16.62^{cd}	12.62^{e}	10.12^{cd}	13.12	328.20^{b}	124.14^{g}	129.41^{ef}	R
Degaga	16.62^{cd}	14.74^{d}	7.62^{fg}	12.99	303.71^{ed}	129.51^{f}	170.36^{c}	R
Tumsa	10.85^{f}	3.16^{j}	4.03^{kj}	6.01	283.53^{g}	84.40^{l}	99.99^{h}	R
Hachalu	12.89^{e}	3.89^{j}	5.27^{ij}	7.35	283.82^{g}	85.92^{l}	110.18^{g}	R
CV	3.74	5.65	9.36	6.25	1.83	2.27	3.42	

Means followed with the same letter(s) in the same column are not significantly different at the probability level of ($p > 0.05$) according to Dunken Multiple range test. CV= Coefficient of variation, R= resistance MR= moderately resistance, MS= moderately susceptible

3.1.4. Yield and yield components

The result revealed that there is a highly significant ($p<0.001$) difference in yield and yield component parameters among the varieties. The number of seeds per pod was significantly different ($p<0.05$) in DebayTelatgen Woreda experimental field but not among the varieties in both Gozamen and Senan locations (Table 3). The statistical analysis showed that a significant ($P<0.05$) difference was observed on grain yield of faba bean in the three locations. The actual highest mean least yield of fababean was harvested from Dosha variety (40.94Qt/ha and 40.25 Qt/ha) and local check(19.65 Qt/haand 21.38 Qt/ha) at Gozamen and Senan woreda experimental fields, respectively (Table 3). In addition, followed to Dosha variety comparable highest grain yield of faba bean was harvested from Tumsa (35.26 Qt/ha and 38.53 Qt/ha) Hachalu (34.6 Qt/ha and 33.25 Qt/ ha) and walki (34.1 Qt/ha and 32.58 Qt/ha) varieties in Gozamen and Senan woreda experimental fields, respectively. However the least faba bean grain yield was encountered from Gebelecho (6.1Qt/ha) varieties at DebayTelatgen woreda experimental field (Table 3). Compared with the location wise the highest and the least grain yield was harvested from Senan and Debay Telatgen woreda experimental field. The low gain yield harvested from DebayTelatgen woreda compared with other experimental fields might be the existent of an erratic rain fall during experimental period.

The study revealed that there were significant ($P<0.05$) difference among varieties in terms of pods per plant in all experimental locations. The maximum and minimum number of pods per plant were recorded from Dosha and obse, Dosha and Moti, Dosha and Degaga, 15.11 and 7.05, 20.0 and 8.36, 14.26 and 11.52, at Gozamen, Senan and DebayTelatgen woreda experimental field, respectively (Table 3). In the case of seed per pod, contradiction to other parameters, there was no statistically justifiable variation among treatments at Gozamen and Senan woreda experimental fields. Across the experimental fields the highest plant height was measured from Tumsa (144.89cm) variety in Gozamen woreda experimental field and the shortest plant height

was measured from NC-58 (69.11cm)variety in Debay Telatgen woreda experimental fields (Table 3). In all experimental fields, yield and yield component data wereconfirmed that number of pods per plant is positively and directly correlated with grain yield quintal per hectare. Generally The variation of yield among varieties across the locations might be due to received erratic rain fall and different soil fertility status of the experimental fields.

Table 3. Mean yield and yield components of Fababean crop affected by fababean gall diseases at Gozamen, Senan and Debay Telatgen woreda during 2015 main cropping season

Varieties	Yield and yield components											
	Gozamen				Senan				Debay Telatgen			
	Qt/ha	Ph	NPPP	NSPP	Qt/ha	ph	NPPP	NSPP	Qt/ha	Ph	NPPP	NSPP
Dosha	40.94^{a*}	144.33^{a}	15.11^{a}	3.05^{a}	40.25^{a}	145.05^{a}	20.00^{a}	3.05^{a}	15.33^{a}	73.72^{f}	14.26^{a}	2.04^{fg}
Tumsa	35.26^{b}	144.89^{a}	14.00^{ab}	3.16^{a}	38.53^{b}	141.16^{c}	15.61^{b}	3.16^{a}	15.25^{a}	82.35^{a-c}	11.52^{g}	1.92^{g}
Walki	34.12^{b}	143.72^{a}	11.83b^{d}	2.88^{a}	32.58^{ef}	144.89^{a}	12.31^{ef}	2.88^{a}	12.92^{c}	79.67^{c-e}	13.27^{c-e}	2.21^{c-e}
Gora	32.65^{c}	142.17^{a}	12.11^{bd}	3.05^{a}	25.50^{h}	144.45^{a}	11.86^{fg}	3.05^{a}	6.55^{jk}	84.95^{ab}	14.16^{a-b}	2.36^{ab}
Bulga70	30.92^{d}	130.06^{c}	10.67^{de}	2.94^{a}	19.00^{k}	130.39^{h}	10.66^{g}	2.94^{a}	7.21^{j}	85.55^{a}	12.29^{f}	2.37^{a}
Moti	27.68^{e}	145.22^{a}	8.22^{f}	3.05^{a}	35.75^{d}	144.33^{a}	8.72^{h}	3.05^{a}	10.70^{g}	75.39^{ef}	12.56^{ef}	2.09^{ef}
Degaga	26.04^{f}	137.33^{b}	13.94^{ab}	2.72^{a}	30.17^{g}	131.46^{h}	14.33^{bc}	2.72^{a}	11.52^{ef}	67.50^{h}	11.51^{g}	1.92^{g}
Mesay	25.75^{f}	138.28^{b}	11.33^{cd}	3.00^{a}	25.33^{h}	137.94^{e}	12.02^{fg}	3.00^{a}	10.92^{fg}	81.88^{a-c}	13.65^{a-c}	2.27^{a-c}
Obse	25.45^{gf}	143.44^{a}	7.05^{f}	3.05^{a}	25.58^{h}	144.83^{a}	8.36^{h}	3.05^{a}	8.26^{i}	79.26^{c-e}	13.21^{c-e}	2.20^{c-e}
Gebelecho	25.41^{gf}	138.77^{b}	8.75^{ef}	*2.88^{a}*	22.92^{i}	136.09^{fg}	12.45^{d-f}	2.88^{a}	6.10^{k}	72.16^{fg}	12.03^{fg}	2.00^{fg}
Hachalu	34.60^{b}	142.47^{a}	10.99^{c-e}	2.94^{a}	33.25^{e}	145.11^{a}	12.73^{c-f}	2.94^{a}	14.08^{b}	81.70^{a-c}	13.61^{a-c}	2.27^{a-c}
Cs20dk	25.00^{gf}	136.11^{b}	13.45^{a-c}	3.00^{a}	34.75^{d}	136.52^{fg}	13.78^{c-e}	3.00^{a}	11.92^{de}	81.27^{a-c}	13.54^{a-c}	2.25^{a-c}
Kasa	24.95^{gf}	138.27^{b}	12.44^{b-d}	2.83^{a}	31.58^{f}	139.16^{d}	13.66^{c-e}	2.83^{a}	12.46^{cd}	76.11^{d-f}	12.68^{d-f}	2.11^{d-f}
Adethana	24.33^{g}	142.95^{a}	8.00^{f}	3.05^{a}	37.12^{c}	142.94^{b}	8.89^{h}	3.056^{a}	9.00^{hi}	81.943^{a-c}	13.65^{a-c}	2.27^{a-c}
Nc-58	19.72^{h}	122.26 ^{d}	12.27^{b-d}	2.67^{a}	31.92f	135.50^{g}	13.00^{c-f}	2.67^{a}	8.42^{hi}	69.11^{hg}	13.40^{b-d}	2.23^{b-d}
Tesfa	19.65^{h}	137.95^{b}	13.26^{a-c}	3.00^{a}	23.08^{i}	137.05^{ef}	13.08^{c-f}	3.00^{a}	12.70^{cd}	80.44^{b-d}	13.72^{a-c}	2.28^{a-c}
Local	18.40^{i}	110.97^{e}	12.66^{a-d}	2.67^{a}	21.38^{ie}	107.44^{i}	14.05^{cd}	2.66^{a}	9.12^{h}	80.83^{a-c}	13.47^{a-c}	2.24^{a-c}
Cv	2.74	1.33	11.37	8.60	2.23	0.50	6.84	8.601	4.27	3.18	3.24	3.24

* Means followed with the same letter(s) in the same column are not significantly different at the probability level of ($p > 0.05$) according to Dunken Multiple range test. CV= coefficient of variation, Qt/ha=yield quintal per hectare, NPPP = No of pods per plant, NSPP= no of seed per pod, Ph= plant height

3.2. Discussion

The severity of gall disease on faba bean was certainly varied within experimental field and across experimental location. The observed differences in the severity of this diseasein the experimental areas could be attributed to the nature of the pathogen which might not have uniform distribution within the field. The reaction differences also observed due to variations in the genetic makeup of faba bean varieties (nature of resistance) and aggressiveness of the pathogen among varieties and locations, environmental conditions such as temperature and altitude might be varied across locations which affect the growth and spread of conidia.The present study certainly in line with, Dereje *et al*; 2012, finding that the disease is highly distributed wider areas of Ethiopia at an altitude ranged from 2500 to 3000 meter above sea level. Moreover, the disease intensity difference across location might be existed due to the cropping history of the experimental field that contributes enough inoculums for infection development and progress. The present study was comparable with (Endal *etal*., 2014) finding that Faba bean gall was prevalent and the most challenging diseases and threatening faba bean production in the country. on the other hand present study was slightly contradicted with (Samuel *et al*; 2008) finding that most local faba bean landraces are highly susceptible to the disease and low yielding. According to (Endal *et al*;2014) among the three regions surveyed, yet the faba bean disease was more severe in Amhara region followed by Tigray and Oromiya regions. The mean disease severity of 22.2%, 11.3% and 7.8% were recorded in Amhara, Oromiya and Tigray regions, respectively. During the study period unfortunately there were no any highly resistant varieties found this newly emerged faba bean gall diseases in all experimental locations.

4. Conclusion and Recommendation

Faba bean is a legume crops grown in different agro ecological zone of Ethiopia and which used for different purpose. However, its production and productivity is constrained by biotic and a biotic factors. Thus, faba bean gall disease is one of the newly emerged biotic disease which curbed the production and productivity of the crops widely in Ethiopia. The present study determined the distribution of faba bean gall disease and the associations of disease with the varieties across location and within the experimental fields. Hence, significant variations were observed in disease parameters, yield and yield components among the varieties in the experimental field. The Evaluated faba bean varieties against faba bean gall diseases were showed highly significant ($p< 0.001$) difference in percent disease severity index and AUDPC values in all experimental locations. Dosha, Tumsa, Walki and Hachalu varieties were demonstrated lower disease severity and AUDPC value compared with the rest of the varieties. As a result, these varieties were revealed high yield and resistance to faba bean gall diseases comparing to the local check Gebelecho and CS20DK in all experimental fields. In Debay Telatgen woreda experimental field Gora (6.55Qt/ha) and Gebelecho (6.50Qt/ha) varieties were showed low yield compared with other varieties. From this study it can be concluded that resistance and high yielder varieties can be used in combination with other control measures wherever the disease is a pervasive and

pressing problem to maximized the yield of the crop. Generally, faba bean gall disease becomes an important disease that calls for due attention in the study area for effective and efficient management with host plant resistance and other alternative management tactics in the future. Therefore, in the future, resistance and high yielder varieties combination with other alternative management options research will be conducted in the potential faba bean growing areas in Ethiopia.

5. ACKNOWLEDGEMENTS

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6. References

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