

# Assessment of Mung Bean (*Vignaradiata*) pests in the Low Land Areas of North Shewa Zone

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## ABSTRACT

Mung bean known locally as “Masho” is a recent introduction in the Ethiopian pulse production and grown in few areas of the country and constrained by different biotic factors. However, the relative importance of each pest across locations has not been assessed and well profiled to sound management strategy. The objective of this study was to assess distribution and intensity of major pests on mungbean. The survey was made in 2016 and 2017 main cropping seasons following the main roads and accessible routes in each survey district (lowland areas of North Shewa Zone) and stops were made at every 5 -10 km intervals based on vehicles odometers as per mung bean fields available. Five stops were made in each mung bean field by moving “X” fashion at each stop interval using quadrants and data were collected from each. The result indicated that, *Apion clavipes* was most prevalent insect pest of mung bean in surveyed areas with maximum prevalence of 100%. Similarly, leaf blight and leaf spot were most prevalent diseases of mung bean in all districts. On the other hand, survey revealed that *Cyperus* spp. was frequently observed weed in both seasons with the highest weed density per m<sup>2</sup>. In 2017, weed Spps. *Cyperus rotundus* and *Echinocloacolona* L. were more frequently obtained weeds of mung bean in the surveyed districts with the consequent frequencies (77.42, 70.97%) and densities (16.11, 2.8 per m<sup>2</sup>). The current study indicated that a complex of pests exist on mung bean in the studied areas. Therefore, pest management strategies need to be devised.

Keywords : Mung Bean, Pests, Assessment, Intensity, Prevalence

## I. INTRODUCTION

Mung bean is one of the most important pulse crops, grown from the tropical to sub-tropical areas around the world (Kumari et al., 2012; Khan et al., 2012). The crop is characterized by fast growth under warm conditions, low water requirement and excellent soil fertility enhancement via nitrogen fixation (Yagoob and Yagoob 2014). Among legumes, mung bean is noted for its protein and lysine-rich grain, which supplements cereal-based diets (Minh 2014). The grain contains 24.2% protein, 1.3% fat and 60.4% carbohydrate (Hussain et al., 2011). Among pulses, mung bean is the most important cash crops in the world (Pandey et al., 2011). It is a very important

crop in developing countries where it is consumed as dry seeds, fresh green pods or leaves due to its high protein, vitamin and mineral content. It is also consumed as forage or green pods and seeds as vegetables (Das et al., 2014). Primarily, the purposes of this crop are for its protein rich edible seeds and fresh sprout. The seed of mung bean mainly used for making soups, bread and biscuits (Sehrawat et al., 2013). On the other hand, mung bean is importance legume to assistance in normal use of land, water resource and enrichment of the soil through nitrogen fixation. Adaptation to short growth duration, low water requirement, ability to increase soil fertility and usefulness in crop rotation practices are also other significances of mung bean (Das et al., 2014).

And also, it has the Ability of improving soil fertility by fixing atmospheric nitrogen into available form with the help of rhizobia species for plant's growth and development are characters of mung bean (Jatet al., 2012).

According to ECX (ECX 2014), mung bean locally as "Masho" is being cultivated as a recently introduced crop in Ethiopia. In Ethiopia, mung bean is mostly grown by smallholder farmers under drier marginal environmental condition (Asratet al., 2012) and the production capacity is lower than other pulse crops. The volume of production is also very small and it is concentrated mainly in Amhara, SNNPR, Oromia regional states and in some woredas of Beneshalgu IGumuz region. Mung bean is a quick crop, requiring 75–90 days to mature. It is a useful crop in drier areas and has a good potential for crop rotation and relay cropping both fertile and marginal lands but prefers well-drained loam to sandy loam with pH ranging with cereals using residual moisture (Sisayet al., 2014). It can grow on a wide range of soils of Mung bean occupies close to 37,774.3 ha of land with annual productivity about 1.14 t/ha in the country and in Amhara region, the crop covers an area of 28,992.86 ha of land with productivity of 1.21 t/ha (CSA 2017). Likewise, the crop covered about 17,490.23 ha of land with annual productivity of 1.22t/ha in North Shewa Zone. The average yield of mung bean under small-holder farmers is not more than 1.1 t ha<sup>-1</sup> in the country (CSA 2017). The low productivity of the crop is attributed to susceptibility to biotic and abiotic stresses. Biotic stresses are major factors limiting the yield and quality of mung bean. Of the biotic category, diseases, insect pests and weeds are important factors limiting the production of food-legume crops as a whole and mung bean specifically in Ethiopia, including Amhara region. The relative importance of each pest in the study area has not been assessed and well profiled to sound

management strategy. Therefore, the objective of this study was to assess the distribution and intensity of major pests of mung bean in the lowland areas of North Shewa zone.

## II. MATERIALS AND METHODS

The survey was conducted in 2016 and 2017 main cropping season in six major mung bean producing districts of North Shewa Zone Amhara Region. Mung bean fields were assessed randomly at intervals of 5-10 km along the main road as mung bean fields exist. A 1 m x 1 m square quadrat was used in 'X' manner at two diagonals across the inspected fields. In each field, total plants within the quadrat were observed and plants were recorded as infected or healthy for diseases and insect pest's data. The mean prevalence, incidence and severity of insect pests and diseases of each field were computed.

Percent of occurrence (prevalence) = (Number of fields with infected)/ (Total number of assessed fields) x 100

Percent incidence (for insect pests and diseases) = (Number of plantes infected)/ (Total number of plants assessed) x 100

Disease severity of each disease was recorded in percentage (%), while severity of insects was in 1-9 scale and finally converted to percentage (%). The results of the survey were summarized by descriptive statics.

On the other hand, mung bean weeds were recorded as count per quadrat and expressed as frequency and density of species (Roger et al., 2015).

Frequency of each was calculated by the formula:

$$F_i = (\sum Z_i)/n$$

Where density of each weed was calculated as

$$D_i = (\sum Y_i)/(S_a)$$

Where:  $F_i$  = frequency value for species  $i$ ;  $Z_i$  =number of sampling units with with weed,  $n$  = total

number of sampling units surveyed;  $D_i$  = density of species  $Y_i$  = number of individual plants of species  $i$  contained in the sampling unit (quadrat or field);  $S_a$  = Surface area of the sampling unit.

### III. RESULTS AND DISCUSSION

Survey results revealed that, the extent of mung bean pests' intensity were variable from field to field, district to district and season to season. In the main crop-growing season of 2016, seventeen (17) mung bean fields were assessed from 3 districts (Antsokia, Efratagidm and Kewet). On the other hand, in 2017 cropping season, 57 fields were surveyed from six districts (Antsokia, Efratagidm, Kewet, Ensaro, Merhabete and Midaweremo).

#### A. Prevalence and Intensity of Mung Bean Diseases in Surveyed Areas

In 2016, mung leaf blight, leaf spot and powdery mildew were prevalent diseases in assessed districts. All fields assessed in 2016 were infected with leaf blight. The corresponding, incidences and severities of 72, 8%; 19.85%, 6.17% and 33, 8% were recorded from Antsokia, Efratagidm and Kewet districts. Similarly, the prevalence of leaf spot was higher (100%) at Efratagidm district. Leaf spot incidences and severities (95, 11.5; 65.5, 8.85 and 56, 25%) were recorded from Antsokia, Efratagidm and Kewet districts, respectively. On the other hand, powdery mildew incidences of 12.5, 17.14 and 40% were recorded from Antsokia, Efratagidm and Kewet districts, respectively, with the corresponding severities of 5, 6.25 and 17.5%. Likewise, in 2017, leaf blight was prevalent disease in all surveyed districts with maximum (57.14%) prevalence at Merhabete district. Leaf blight, leaf spot and powdery mildew were observed on most of surveyed districts with consequent prevalence's of 33.33, 44.44 and 22.22% (at Antsokia), 20% (at Efratagidm), 6.67, 60 and 13, 33%

(at Kewet, 18.18, 54.45 and 36.6% (at Ensaro). Only leaf blight and root rot were obtained at Merhabete with mean prevalence of 57.14% leaf blight and 14.29% root rot. Generally, the most prevalent diseases of mung bean in the surveyed districts were leaf blight, leaf spot and powdery mildew. The result of this study is in agreement with (Ramanathan, et al., 2002; Srinives, 1996), who reported that most diseases of mung bean are leaf blight, leaf spot and powdery mildew. Poehlman, (1991), also stated leaf spot caused by (*Cercospora canescens*), powdery mildew (*Erysiphe polygoni*) are the most important diseases of mung bean.

The intensities of diseases were varied across locations and seasons. The result of this study is agreed with Boudreau and Mundt (1992), who reported that variation among environments, crops and cropping regime brings about simultaneous variation in diseases and their intensities. The prevalence's of leaf blight, leaf spot and powdery mildew were higher in 2016 than 2017. This might be due to favorable weather condition in 2016. Leaf blight disease was most prevalent disease in 2016 and it was observed on all surveyed fields. Suliet al., (2017) reported that ,mung bean blight has been rapidly spreading and is prevalent in the three major mung bean- producing regions of China.

Table 1: prevalence's and severities of mung bean diseases in the surveyed districts

District		Antsokia	Efrata	Kewet	Ensaro	Merhabet	Mida	
leaf blight	2016	Prev	100	100	100	*	*	
		Sev	8	6.17	8	*	*	
	2017	Prev	33.33	20	60	18.18	57.14	20
		Sev	6.67	10	10	7.5	7.81	2
leaf spot	2016	Prev	50	100	60	*	*	
		Sev	11.5	8.85	25	*	*	
	2017	Prev	44.44	20	60	45.45	0	0
		Sev	11.5	8.85	25	*	*	

		Sev	16.56	12.5	11.94	15	0	0
Powdery	2016	Prev	50	28.57	40	*	*	*
		Sev	5	6.25	17.5	*	*	*
	2017	Prev	22.22	20	13.33	36.36	0	0
		Sev	8.13	2.5	4.35	6.25	0	0
Root rot	2016	Prev	0	0	0	*	*	*
		Inc	0	0	0	*	*	*
	2017	Prev	0	0	0	0	14.29	0
		Inc	0	0	0	0	6.43	0

Prev.: prevalence, Sev: severity, Inc: incidence and \* districts were not assessed due to early maturing of the crops

**B. Prevalence and Intensity of Mung Bean Insect Pests in Surveyed Areas**

Survey result showed, in the main season of 2016, 17 fields of mung bean were assessed from three districts of North shewa Zone (Table 2 and 3). Apion, grass hopper, leaf minor, stripe beetls and thrips were widely distributed across surveyed districts in 2016. The prevalence's of apion were 83.33, 42.86 and 83.33% in Antsokia, Efratagidm and Kewet districts, respectively, with the corresponding severities of 22.22, 14.78 and 22.22%. Grass hopper also the most commonly encountered pest, found in 77.78% of the fields surveyed. Similarly, the mean prevalence's i.e. 49.21, 15.88, 38.10 and 25.40% were recorded from bugs, leaf minora, stripe beetles and thrips, respectively.

In 2017 the mean prevalence of apion was 87.80% with mean severity of 35.86% in assessed districts (Table 2 and 3). Regarding severities of apion, the consequent percent severities (15.87, 18.89, 17.03, 15.5, 17.9 and 8.88%) were recorded from Antsokia, Efratagidm, Kewet, Ensaro, Merhabete and Midaweremo districts. On the other hand, ball worm was observed only in 2017 with mean prevalence's and severities of 71.43, 10.67 (at Antsokia), 50, 3.89% (at Efratagidm), 41.66, 15.55% (at Kewet), 16.67,

11.11% (at Ensaro) and 11.11, 2.22% (at Merhabete) districts, respectively. With regard to mung bean bugs, it was prevalent only at Merhabete district with mean severity of 11.11% in 2017.

Accordingly, the insect distribution and intensity differed in each district and season. These differences can be attributed to differences in the distribution of host plants, the growth stage of host plants, pest control and cropping patterns in the area (Evans et al. 2013). The pest's species present in the mung bean fields in North Shewa Zone were Apion, grass hopper, bugs, ball worm, leaf minor, stripe beetles, thrips and beetles. These pests attack several species in the family Leguminosae, such as soybeans, mung beans, peanuts, pigeon pea, cowpea, common beans (Tengkano 1986).

Among these pests, Apion clavipes was the most important pests in all mung bean fields at both seasons. A.clavipes has become a regular pest North Shewa Zone (Kewet district) since 2012/13 cropping season (DBARC unpublished) especially during main cropping season. Indati et al., (2017), reported that in India, Apion clavipes is an important pest in mung beans and it may cause damage pods up to 49%. It was also reported as a major pest of pigeon pea (Thakur et al., 2012) and mung bean from India (Talwar 2014). Currently, this pest has spread to all districts of North Shewa Zone that grow mung bean.

**C. Frequencies and Densities of Mung Bean Weeds in Surveyed Areas**

A total of 27 weeds were observed from mung bean fields in the surveyed area in 2016 and 2017 cropping season. The frequency of occurrence of individual weed species ranged from 3.2% (Anagallis aruense) up to 65% (Cyperus spp and Amaranthus spp), while the density ranged from 0.05 (Capsella burseparstoris(L.)) up to 43.93 (Cyperus spp.) per m<sup>2</sup> in 2016 (Table 4). In 2016, Cyperus spp. was observed frequently with mean frequency (65%) and density

(43.93/ m<sup>2</sup>). Regarding weed frequency, *Amaranthus* spp. also had the highest frequency (65%) with mean density of 2.51/ m<sup>2</sup>.

Also, in 2017, the frequency of individual weed species ranged from 3.2% up to 77.42%, while the density of weed per m<sup>2</sup> ranged from 0.4 to 16.11 (Table 4). Weed Spps. *Cyperus rotundus* and *Echinochloa acolona* L. were more frequently obtained weeds of mung bean in the surveyed districts with the consequent frequencies (77.42, 70.97%) and densities (16.11, 2.8 per m<sup>2</sup>).

The survey revealed that *Cyperus* spp. was frequently observed weed in both seasons with the highest weed density per m<sup>2</sup>. This implies that, it is economical importance of this weed for mung bean production in surveyed districts. Whereas, *Echinochloa acolona* L was most frequent weed in 2017 next to *Cyperus rotundus*. During the field survey it was observed that weed spp. frequency and density varied with season and location.

Though some weeds, such as *Parthenium* spp. had low frequency (Table 4), they were considered to be problematic weeds. Thus, high frequency does not indicate the economic or sociological importance of a weed species, as some weeds have other uses, such as feed for livestock, which can be especially important in the lowland areas.

Table 2: prevalence’s and severities of mung bean insect pests in Antsokia, Efratagidm and Kewet districts

Insect pests	Antsokia				Efratagidm				Kewet			
	2016		2017		2016		2017		2016		2017	
	Prev	Sev.	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev
	Apion	100.0	33.3	100.0	15.9	42.9	14.8	100.0	18.9	83.3	22.2	75.0

Ball worm	66.7	0.0	11.1	0.0	71.4	0.0	10.7	14.3	0.0	11.1	0.0	50.0	0.0	3.9	66.7	0.0	11.1	0.0	41.7	0.0	15.6		
Bugs	66.7	0.0	33.3	0.0	42.9	0.0	11.1	100.0	0.0	14.3	0.0	0.0	0.0	0.0	66.7	0.0	33.3	0.0	0.0	0.0	0.0	0.0	
Grass hopper	16.7	0.0	11.1	0.0	0.0	0.0	0.0	14.3	0.0	11.1	0.0	0.0	0.0	0.0	16.7	0.0	11.1	0.0	16.7	0.0	3.3	0.0	
Leaf minor	50.0	0.0	11.1	0.0	85.7	0.0	9.6	42.9	14.3	11.1	0.0	50.0	0.0	2.2	50.0	0.0	11.1	0.0	58.3	41.7	22.2	0.0	
Stripe beetls	16.7	0.0	11.1	0.0	0.0	0.0	0.0	14.3	0.0	11.1	0.0	0.0	0.0	0.0	16.7	0.0	11.1	0.0	16.7	0.0	3.3	0.0	
Thrips	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beetls	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Prev.: prevalence, Sev.: severity, Inc.: incidence and \* districts were not assessed due to early maturing of the crops

Table 3: prevalence’s and severities of mung bean insect pests in Ensaro, Merhabete and Midaweremo districts

Insect pests	Ensaro				Merhabete				Mida			
	2016		2017		2016		2017		2016		2017	
	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev	Prev	Sev
Apion	*	*	66.7	15.5	*	*	100.0	17.9	*	*	100.0	8.9
Ball worm	*	*	16.7	11.1	*	*	11.1	2.2	*	*	0.0	0.0
Bugs	*	*	0.0	0.0	*	*	11.1	11.1	*	*	0.0	0.0
Grasshopper	*	*	16.7	22.2	*	*	11.1	2.2	*	*	0.0	0.0
Leafminor	*	*	0.0	0.0	*	*	0.0	0.0	*	*	0.0	0.0
Stripe beetls	*	*	0.0	0.0	*	*	0.0	0.0	*	*	0.0	0.0
Thrips	*	*	100.0	19.3	*	*	0.0	0.0	*	*	0.0	0.0
Beetls	*	*	0.0	0.0	*	*	11.1	11.1	*	*	0.0	0.0

Prev.: prevalence, Sev.: severity, Inc.: incidence and \* districts were not assessed due to early maturing of the crops

Table 4: Frequencies and densities of mung bean weeds in North Shewa Zone

Weeds		2016		2017	
Local name	Scientific name	F (%)	D /m <sup>2</sup>	F (%)	D /m <sup>2</sup>
Engicha	Cyperusrotundus L.	65.0	43.9	77.4	16.1
Teseri	Eragrostiscilianensis	8.1	0.1	71.0	2.8
Wofankur	Commelinabenghalensis L.	16.7	0.1	45.2	0.9
Aluma	Amaranthusalbus	65.0	2.5	41.9	1.7
Besobila	Justiciahetrocarpa-linda-Acanthaceae	8.3	0.2	41.9	1.1
Yemognfkr	Xanthium strumarium L.	-	-	38.7	4.1
Serdo	Cynodondactylon	25.0	6.6	35.5	3.5
Kechekech	Polygonumaviculare	35.0	2.1	25.8	1.5
Kosheshila	Echinopscornigerus	51.7	20.6	25.8	2.0
Parthinum	Partheniumhysterophorus	-	-	19.4	3.3
Merarita	Sidaacuta L	-	-	16.1	2.6
Muachera	Brachiariaeruciformis	41.7	6.7	6.5	4.0
unkown	Acanthosporium	18.3	0.5	6.5	0.4
Antaria	Euphorbia hirta L.	-	-	3.2	0.4
Asendabo	Phalarisparadoxa L.	-	-	3.2	1.2
Yetjasiga	Chenopodium album	-	-	3.2	3.0
Yesetmilas	Anagallisaruense	3.2	11.4	-	-
Chegogit	Xanthium Strumarilum L.	45.0	6.1	-	-
Beganefssie	SeneciosteudelieAstracel	16.7	0.5	-	-
Buahita	Oxygonumeruciformis	16.7	0.2	-	-
Etsefaris	Dathuraspp	16.7	1.4	-	-
Geso	Capsella burse-parstorisL.	8.3	0.1	-	-
Kermame	Pupalialappace L. Juss	33.3	4.8	-	-
Unkown	Vernoniabipontini(vake)	20.0	2.3	-	-
Wushana	Oxygonumsinuatium	8.3	0.3	-	-
Yejibchama	Cyathulaprostrate L.	16.7	1.0	-	-
Yewshasinde do	Setaria spp.	30.0	0.7	-	-

F: frequency, D: density weeds with their local name will be changed to their scientific name after identification completed by Ambo plant protection Research center

#### IV. CONCLUSIONS AND RECOMMENDATION

The study confirmed that mung bean grown in all surveyed districts of North Shewa Zone with different level of production coverage. Furthermore, the crop was found to be infected with different pests and therefore prone to various diseases, insect pests and weeds. During the survey, four diseases, eight insect pests and around 27 weeds were observed on mung bean fields. Even though the yield loss caused by each pest is not clearly studied and quantified in studied crop and areas, this study indicate the presence of complex of pests at different levels in the surveyed districts.

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