PREVALENCE OF ECONOMICAL IMPORTANT DISEASES OF GRAPE VINES IN HAGAZ AGRO TECHNICAL SCHOOL OF ZOBA ANSEBA IN ERITREA

Syed Danish Yaseen Naqvi*, Adil Hameed, Simret Mussie, Yodit Fitsum and Yodit
Department of Plant Protection,
Hamelmalo Agricultural College, Hamelmalo, Eritrea.
* E-mail of corresponding author: syeddanishnaqvi84@gmail.com.

ABSTRACT

The study was conducted at Hagaz Technical School of Zoba Anseba in 2012 to 2013 from 30th November 2012 to 2nd March, 2013. Investigations were conducted for identification, incidence and severity of powdery mildew, downy mildew and anthracnose caused by Uncinula necator, Plasmopara viticola and Colletotrichum gloeosporioides respectively. The study showed that all three were found to be the common diseases in all the grape vines under the study. There was a significant difference on disease severity during the time of study. The highest disease severity (39.05 %) was observed from powdery mildew where as the lowest was seen (1.43%) from anthracnose at 21 to 50% level of disease severity index. In case of lowest severity level i.e. 0.5-1% highest disease severity was found in case of anthracnose while lowest in case of powdery mildew; and incidence maximum due to powdery mildew followed by downy mildew (67.43%) and anthracnose (31.92%).

Key words: Powdery mildew, downy mildew, anthracnose, disease incidence, disease severity

INTRODUCTION

Grape (Vitis vinifera L.) is among the oldest plants (90-95 million years) on earth, existing almost at the time when dinosaurs flourished as evidenced by the recent discoveries from western Kazakhaton (Shanmugavelu, 2003). Hyams (1954) traces its antiquity to 700BC and states that it was associated with man as a cultivated plant much before wheat or barley According to De Candolle (1886), the cultivation of grape in Egypt goes back to 4000BC. It is believed that grape cultivation originated near Caspian Sea in Russia that spread westward to Europe and American continents and eastward towards Iran and Afghanistan.

Grape is the most important temperate fruit crop that has acclimatized to the subtropical and tropical agro-climatic conditions. It is a fairly good source of minerals like calcium, phosphorus, iron and vitamins such as B1 and B2. Grape is known for its cultural dualism between subsistence-oriented growers and export oriented large corporate growers in India. Currently, the world production of grapes is over 6.5 million tonnes annually (Anon., 2006) occupying more than 10 million hectares in different countries with USA, Brazil, Italy, France, Spain, Portugal, Turkey and India being the major producers of grapes (Anon., 2004a).

The losses due to insect pests and diseases are high and for their management many sprays of several pesticides are required which accounts for 30 percent of the total cost of production. Among the diseases occurring on grapes, fungal diseases are the most destructive followed by a few bacterial, viral and nematode infections of minor importance. The incidence of diseases depend not only on the presence of the pathogen but also on the vineyard management practices and environmental factors like temperature, rainfall, and humidity which has an important bearing on the epidemics of any disease. Though relatively quick and visible results are obtained by chemical pesticides, the use of biological control methods is preferred particularly about 45 days before the harvest or during the berry development for management.
of pests and diseases to minimize pesticide residues. The losses due to anthracnose disease are to the tune of 15-30%.

This paper reports the results of a survey of grape vines prevalent diseases and disease intensity in Hagaz region (Hagaz Agro Technical School) of Zoba-Anseba, Eritrea during the 2012-13 agricultural years.

MATERIALS AND METHODS

The present investigations were carried out in the laboratory of Plant Protection Department of Hamelmalo Agricultural College, (HAC), Hamelamalo, and field of Hagaz Agro Technical School, Hagaz of Zoba-Anseba, Eritrea during 2012-13. Sub Zoba Hagaz is located, about 25 km west from Keren in Zoba Anseba at an altitude of 851 m from mean sea level; with mean annual rainfall ranging from 200-300 mm. The months of March, April and May are the hottest with mean maximum temperature between the ranges of 39° to 42°C. December and January are the coolest months with mean minimum temperature up to 11° to 24°C. The relative humidity fluctuates between 40 to 85 per cent.

Collection and identification of diseases

Representative samples, based on visual symptoms of the diseases were drawn from each plot at random as per methods described by Sukhatme (1954) and Yates (1960). At least 10-25 % of the grape vines fields were covered. Sampling for smaller units, that were less than 6.0 m² was done along the diagonals of the fields at regular intervals (fortnightly). For selected areas; a group of 5 samples [leaves (grape)] were drawn following an inverted W pattern. The sampling sites were approximately equidistant from each other along the sampling pathway. At each site, a specified number of vines at specified distance on the row were carefully examined on the basis of important symptoms of diseases.

Slide preparation and identification

The fungus had already made their colonies on leaves. Then slides were prepared by taking some samples of fungus randomly from each selected plot. These samples were identified on the basis of colony characteristics and microscopic examinations (Fig. 3.1). Standard books and papers were consulted during the examination of these fungi to determine what type of fungus each plot contained. The magnifications used through the binocular compound microscope were 10x and 40x and then some pictures were taken by camera having 16 mega pixels (mp).

Survey for powdery mildew, Downy mildew and Anthracnose

Detailed survey on the incidence and spread of the prevalent diseases of grape was carried out in Hagaz Technical School. The most commonly grown varieties of grapes in these areas are víz., Barberia (red), Nero (red), Srah(red), Cabernet(red), Melot(red), Sandioverge(red), Malvasia(white), Scavia(red), Maltopwllichano(red) and Muscata (white). An intensive survey was carried out in this area to determine the incidence and severity of powdery mildew, downy mildew and anthracnose during 2012-13 (Fig 3.2).

Fields with different variety of grapes were covered under the survey programme. In each plot, seven samples were selected randomly on both sides of the road and in each field; five spots of one square meter area were selected randomly. Powdery mildew and downy mildew severity was recorded by following 0-9 scale developed by Mayee and Datar (1986), and then the percent disease incidence was calculated by using the formula of Wheeler (1982). Fifteen vines were collected per sample for disease incidence. The formula used is as follows:

(a) Disease incidence = (Number of infected vines/ total number of vines) x 100
(b) Mean per cent severity was calculated as: Disease severity (%) = \{[B/ (Ax9)] x100\}

Where, B= Total disease rating, A= Total number of samples and 9= Maximum grade

0-9 scale for grape diseases rating as given by Mayee and Datar (1986); refers to corresponding percent area under the point.

Disease severity (%) 0.5 to 1 2 to 5 6 to 20 21 to 50 more than 50
Fig. 3.1 Slide preparation in lab for identification of fungi

Fig. 3.2. Survey on the incidence and severity of diseases of grapes during 2012-13
RESULTS AND DISCUSSION

Collection and identification of fungal diseases on grapes
The diseased samples/specimen showing typical symptoms of powdery mildew, downy mildew and anthracnose of grapes were collected from Hagaz regions during survey.

Symptomatology
The disease is manifested on all the aerial parts of grapevine in green stage; most frequently on the leaves, new shoots and fruits. The powdery mildew of grapes were identified by the presence of white powdery (ash like) coating in patches on both sides of the leaves, young shoots and immature berries Figure 4.1-4.2. The affected leaves turn pale and curl up.

Fig. 4.1 Powdery mildew infected grapevine tissues (Figure 4.1) Powdery mildew colonies on the axial surface of an infected grape leaf. (Figure 4.2) mature grape bunch showing damage caused by early season powdery mildew infection

The first evidence of the downy mildew disease appeared on infected leaves develop yellowish-green and translucent “oily” lesions on their upper surfaces. As lesions expand, the affected areas turn brown, necrotic or mottled. On the corresponding underleaf surface sporulation of the pathogen, – a delicate, dense, white to grayish, cottony growth–occurs (Figure 4.2-4.3).

The first evidence of the anthracnose disease appeared on the young leaves having small, circular to irregular dark brown spots gradually attaining 1-2 mm diameter in size. As the disease developed the central portion of these spots turned grayish with dark brown margins. Similar symptoms have been recorded by various researchers (Prasad and Nirvan, 1965, Suhag and Grover, 1977, Bulit and Lafon (1978), Pathak, 1980, Shanmugavelu, 1989 and Chadha and Shikhamany, 1999, Singh, 2000, Halleen and Holz, 2001, Grove, 2004 and Calonnec et al. 2006.
Identification
During the course of investigation three fungal pathogens associated with powdery mildew, downy mildew and anthracnose of grapes, viz. *Uncinula necator*, *Plasmopara viticola*, and *Colletotrichum gloeosporioides*, were encountered. The conidial morphology of *U. necator* read as; Conidia are produced long chains, and are ellipsoid to almost cylindrical. (Fig 4.4 A). In case of downy mildew on the young fruit the sporangiophores emerged through lenticels. Each sporangiophore produced four to six branches at nearly right angles to the main stem, and each side branch produced two, sometimes three, secondary branches. Single, lemon shaped sporangia (conidia) are formed at the tips of the secondary branches. The conidial morphology of *C. gloeosporioides* read as; conidia hyaline, 1-celled, oblong or ovoid (Fig 4.4 B). Similar, morphological features were recorded in the past investigations confirming these fungal pathogens with Powder mildew and Downey mildew of grapes Porwal and Sharma, 1974 and Kumar et al., 1994, Haleen and Holz, 2001, Grove, 2004 and Callonnec et al. 2006, Venugopalan and Rawal (2006).
Survey on the Incidence and Severity of Powdery mildew, Downy mildew and Anthracnose of Grapevines.

Disease incidence
It was observed that in general the incidence of powdery mildew was severe during the survey throughout the grape growing Hagaz region. All of the vines showing the powdery mildew while in case of anthracnose incidence was 31.92%, but incidence of downy mildew was 67.43%. Graph 4.1 showed that an overview result of the entire disease incidence. That showed the dominancy of powdery mildew as compared to the downy mildew and anthracnose less than 75% of disease incidence. However Anthracnose was the least among them.

Disease severity index
In the table 4.1 showed that powdery mildew was more severe than Anthracnose that is 33.33 % unlike in Anthracnose which was 1.43% at 21 to 50% level of disease severity index. At 6-20% level powdery mildew more severe i.e. 39.05 followed by downy mildew and anthracnose while at the level of 2-5% severity downy mildew showed severity 34.04 followed by powdery mildew (25.10%) and anthracnose. In case of lowest severity level i.e. 0.5-1% highest disease intensity found in case of anthracnose while lowest in case of powdery mildew. In addition to this the level of significance at 5% among the two diseases that is powdery mildew and Anthracnose was 7.896 and 5.280 respectively. Even though the percentage disease coverage in downy mildew was relatively higher than Anthracnose, there was no significant difference among them. But there was significant difference between powdery mildew and downy mildew which was reported as 7.89 and 5.52% respectively. In general the result shows powdery mildew is more severe and to be the most dominant.

In the present survey powdery mildew was the most destructive as compared to the other diseases that agreed with Pearson and Goheen (1990). Generally all the species of Vitis vinifera were comparatively susceptible to Uncinula necator, in which it was adopted in the report of (Large,1940). The maximum infection of those diseases occurred during the favorable environmental condition and susceptible phenological stage of the host.

Graph 4.1. Disease incidence of Powdery mildew, downy mildew and anthracnose of grapevine during 2012-13
Table 4.1: Disease severity index

<table>
<thead>
<tr>
<th>Level of a disease</th>
<th>Anthracnose</th>
<th>Downy mildew</th>
<th>Powdery mildew</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 –1%</td>
<td>66.904</td>
<td>34.524</td>
<td>0.190</td>
</tr>
<tr>
<td>2.0 –5%</td>
<td>19.524</td>
<td>34.042</td>
<td>25.098</td>
</tr>
<tr>
<td>6.0 –20%</td>
<td>11.904</td>
<td>21.428</td>
<td>39.048</td>
</tr>
<tr>
<td>21 –50%</td>
<td>1.427</td>
<td>9.950</td>
<td>33.33</td>
</tr>
<tr>
<td>≥ 50%</td>
<td>0.00</td>
<td>0.00</td>
<td>2.284</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>L.S.D (at 5% level of significance)</td>
<td>5.280</td>
<td>5.519</td>
<td>7.896</td>
</tr>
<tr>
<td>Coefficient of Variation</td>
<td>17.705</td>
<td>18.469</td>
<td>26.426</td>
</tr>
</tbody>
</table>

**SUMMARY**

Grape is the most important temperate fruit crop that has successfully adapted to the sub-tropical and tropical agro-climatic conditions. Its economic significance lies in export potential as fresh table fruits and wine production as well as other processed products such as raisins and to a lesser extent juice. Hagaz sub zoba has the distinction of cultivating grapes under subtropical conditions and has the second largest area under grapes in Eritrea. However, the grape production suffers from losses due to insect pests and diseases. Powdery mildew, downy mildew and anthracnose or “Bird’s eye spot” as referred popularly have been major diseases on grapes that appear from the beginning of the crop growth and causes long lasting effect on the vine growth and yield potential of the crop.

Historical evidences point to extremely high losses due to Powdery mildew, Downy mildew and Anthracnose of grapes from different grape growing areas around the world. Powdery mildew, downy mildew and anthracnose caused by *Uncinula necator*, *Plasmopara viticola* and *Colletotrichum gloeosporioides* respectively. In surveyed region all three diseases reported and are most damaging and widely prevalent and reduce the quality and quantity of the crop. An extensive roving survey carried over Hagaz region for the incidence and severity of Powdery mildew, Downey mildew and Anthrancnose on grapevine revealed that generally the incidence and severity of powdery mildew was higher followed by downy mildew and anthracnose during the survey.
REFERENCES