International Journal of Research in Agriculture and Forestry
Volume 5, Issue 11, 2018, PP 31-34
ISSN 2394-5907 (Print) & ISSN 2394-5915 (Online)

Survey and Identification of Black Cumin (*Nigella Sativa* L.) Disease in Ethiopia

Merga Jibat, Wakjira Getachew ommit a., Habetewold Kifelew, Abukiya Getu

Ethiopian Institute of Agricultural Research Tepi National Spices Research Centre, P.O.Box 134, Teppi, Ethiopia
Ethiopian Institute of Agricultural Research Holota Agricultural Research Centre, P.O.Box 2003, Addis Ababa, Ethiopia

***Corresponding Author:** Merga Jibat, Ethiopian Institute of Agricultural Research Tepi National Spices Research Centre, P.O.Box 134, Teppi, Ethiopia,Email: mergajibat@gmail.com*

ABSTRACT

Black cumin occupy an important role in food flavors, perfumes and for preparation of medicine. However, diseases are major limiting factors for the cultivation and production of these plants in many agro-ecologies of the country. Therefore, the aim of this study was to identify diseases of black cumin plants in different agro-ecologies of Ethiopia. A survey was conducted in major growing areas of black cumin in major growing areas of Ethiopia during 2016 and 2018 main cropping season. Disease assessments were conducted by using 0.5m x 0.5m quadrate laid along diagonal of the fields. Moreover, plants with in the quadrants were thoroughly examined from base to the apex for diseases incidence and severity. The major cumin diseases observed were wilt (0-72%), blight (0-88%), and powdery mildew (0-60%) in moderate to severe form. Other diseases parasitic plant Orobanche were the emerging problems in black cumin.

Keywords: *Black Cumin, blight, field survey, powdery mildew, wilt*

INTRODUCTION

Black Cumin (*Nigella sativa* L.) is a member of Apiaceae (Umbelliferae). This species is originated in Egypt and East Mediterranean, but is widely cultivated in Iran, Japan, China and Turkey (Shewaye, 2011). Black Cumin has a long history of uses for food flavors, perfumes and medicinal values. Oil has been used for bringing smell to some medicines, sterilizing of surgical operation fiber, production of some veterinary and agricultural medicines and plastic components (Aminpour and Karimi, 2004).

Black Cumin seeds have an aromatic odor and bitter taste. They are used as an essential ingredient in soup component, sausages, cheese, cakes and candies. The Ethiopian variety of cumin seed accumulate up to 50% thymol, a monocyclic phenolic compound. The presence of this compound makes cumin valuable source for health care Industry (Black et al., 2005) and medicinal purposes (Ashraf and Orooj, 2006). In Ethiopia, it is commonly used in Amharic "*Berbere*" in which it tends to reduce its hotness (Hedberg et al., 2003), for preparation of curries, bread, katikala (Jansen, 1981),"*Shamita*" (Mogessie and Tetemke, 1995), traditional Ethiopian stews, "*Wot*" and preservation of butter. However, diseases are major limiting factors for the cultivation and production of black cumin in many agro-ecologies of the country.

One of the most common problems encountered by farmers throughout the world is a control of pests that interfaces with agricultural production. It causes a serious damage to crops by effectively competing with the beneficial and desired crop, damaging plant and plant parts and by other chemical effects. In addition, the pest increases labor that adds to the cost of production, and reduces yields of crops. Survey of the status of diseases in crops is essential to determine general levels of crop health, or the presence of particular diseases of quarantine significance, prioritization of problems to enable proper allocation of crop protection resources, and to assess the losses caused by crop diseases.

Yet, there was no research based information on the major of black cumin in the major growing areas of Ethiopia. Taking this in to consideration, the crop protection team of Tepi National Spices Research Centre was initiated this survey study with the aim of identifying

problematic diseases and providing baseline information on the diseases of black cumin in the study area. Furthermore, it was also aimed to make the information available for any individuals or an organization who was interested for diseases of black cumin for further works.

MATERIALS AND METHODS

The survey was conducted at East showa zone (in Ada'a, Chafe donsa, and akaki districts), Arsi zone (Shirka, Hela Zambaba, Hela Tareta, Zambaba Hela, Birbof Cole) and Bale zone (Goro, Ginir and Gololcha district) of Oromia region. Disease samples were collected for isolation and identification of pathogens, and fields were assessed for incidence of major diseases of cumin. Within selected fields a quadrant of 0.5m x 0.5m was thrown and disease incidence and severity were taken for every quadrant by crossing the fields diagonally. Data were recorded for wilt, blight, powdery mildew and other diseases. Diseases incidence was recorded as percentage incidence in a field for wilt, while foliar diseases such as blight and powdery mildew were scored on 0-5 scale (where 0= absolutely free from disease, and 5 =>50% of the area infected).

Other information like crop stage, cultivar, cropping sequence, pesticides application was also taken into consideration in each district. The details of on-farm survey of black cumin diseases are given in table 1.

RESULTS AND DISCUSSION

The major cumin diseases observed on farmer's field were wilt (0-72%), blight (0-88%), and powdery mildew (0-60%) in moderate to severe form. Prevalence of *Orobanche* (parasitic plant) was also observed in few fields, these can be considered as the emerging problems in black cumin. Black cumin crop was in different stages of growth during the survey, ranging from flowering to grain maturity. In black cumin crop occurrence of wilt, powdery mildew and blight diseases were observed in one or the other places surveyed during main cropping season of 2016 and 2018 in moderate to severe form. The district wise prevalence of different diseases is depicted in table 1.

Table1. *Distribution of cumin diseases in different production areas during 2016 and 2018 main cropping season.*

Zone	District	Cultivars grown	Disease Identified
East Showa	Chafe Donsa	Dershaye	Wilt, Blight, Powdery mildew, Yellowing symptoms*
	Akaki	Eden	Wilt, Blight, Powdery mildew,
Arsi	Hela Zambaba	Darbera	*Orobanche* (parasitic plant),Yellowing symptoms
	Hela Tareta	Local	Wilt, Blight, *Orobanche* (parasitic plant)
	Birbof Cole	Local	Wilt, Blight, *Orobanche* (parasitic plant)
	Zamba Hela	Local	Wilt,Blight, Yellowing symptoms, *Orobanche* (parasitic plant)
Bale	Ginir	Eden	Wilt, Blight, Powdery mildew
	Goro	Local	*Orobanche* (parasitic plant), wilt
	Gololcha	Local	Yellowing symptoms, wilt

Apart from these, other phyto-pathogenic diseases were also observed in the scattered area. The yellowing disease i.e. yellowing of the plant parts initially and later seed become hollow and yellow green and later the whole plant dries. The affected seeds becomes watery and fragile, if the plants survive its seed remains hollow and light weight, which can be clearly differentiated from the healthy seed. The prevalence of these above mentioned yellowing symptoms were observed in only in some farmers fields in low frequency. In some districts, in few fields cumin plants showing disease symptom resembled to the phytoplasma disease, phyllody were observed. In a very limited area of Hela Zambaba and Zambaba Hela districts the crop was infested with parasitic plants like *Orobanche* and *Cuscuta*.

Incidence of wilt caused by *Fusarium oxysporum* f.sp. *cumini* was evident in almost all fields of each village surveyed and varied from 0 to 72% with a mean incidence of 2.9 to 32.6% in different districts of surveyed area (Table 2). The second highest incidence of diseases observed were blight caused by *Alternaria burnsii* on foliage where the percent disease incidence varied from 0 to 88% with a mean score of 2.1 to 35.8%. Powdery mildew caused by *Erysiphe polygoni* was observed in some areas and its percent disease incidence ranged from 0 to 60% with mean score of 13.9-42%.

This result was agreed with (Gaur, 1949) who reported the existence of wilt disease in black cumin is caused by species of *Furasium.* On the basis of the specificity of the wilt pathogen to its

host, (Patel et al., 1957) identified the pathogen as *F. oxysporum* f.sp.*cumini*. In survey the early sown cumin matures early and escapes powdery mildew.

Table2. *Prevalence of major cumin diseases in different production areas of Ethiopia during 2016 and 2018 main cropping season.*

Zone	District	No. of fields	Wilt (%)		Blight (%)		Powdery mildew (%)	
			Mean	Range	Mean	Range	Mean	Range
East Showa	Chafe Donsa	15	7.6	1.7-21.8	29.3	0.75	16.6	3.5-50
	Akaki	15	9	0-10	20.1	0-65	-	4-25
Arsi	Hela Zambaba	15	32.6	0-18	18.6	0-54	13.9	0-29.5
	Hela Tareta	11	7.7	0-39	27.5	0-88	-	-
	Birbof Cole	14	4.9	0-42	35.8	0-71	-	-
	Zamba Hela	15	12.9	5-30	30.2	0-52	-	-
Bale	Ginir	7	22.6	0-72	2.1	0-16	-	-
	Goro	7	-	-	24.8	14-38	42	20-60
	Gololcha	2	2.9	0-17	4.2	0-12	-	-

Incidence of blight was severe in most of fields surveyed during 2016 as compared to 2018 may be due to variation in the prevailing environmental conditions. *Alternaria* blight of cumin was first reported from Bombay Presidency by (Uppal, 1930) and the causal organism was identified as *Alternaria burnsii* (Uppal et al., 1938). The seed borne nature of pathogen was observed by (Uppal et al., 1938) and (Patel and Desai, 1971). In India *Erysiphe polygoni* is the most important causative of powdery mildew diseases in seed spices including black cumin (Uppal and Desai, 1933).

The information collected revealed that wilt and blight diseases were wide spread and occurred in Akaki and Chafe districts of East Showa and Zambaba Hela, Hela Zambaba, HelaTareta, Gale Babo and Birbof Cole districts of Arsi zone and Goro, Ginir and Gololch districts of Bale Zone. Whereas, powdery mildew appearance was observed in only few districts. Few fields were also infested with parasitic plant *Orobanche* in Hela Zambaba and Hela Tareta districts of Arsi zone. The two air born diseases powdery mildew and blight are highly weather dependent, hence prophylactic management strategy is very much needed to combat them. The emerging problems of yellowing and *Orobanche* also need proper attention to understand the host-pathogen/plant interaction and its management strategy to check its spread in wide areas with time.

CONCLUSION

This study is the first known extensive research for identification of the diseases, associated with black cumin in Ethiopia. It is essential to give priority to identify sources of resistance to important diseases and to breed to produce new varieties resistant to single or multiple diseases resistance with desired qualities of produce. The production technology needs further researches on cultural practices which may suppress the pathogens and diseases caused by them. Hot spots where the disease is endemic should be located to screen the germplasm lines against specific diseases. On the contrary disease free areas should also be known for production of high quality pathogen free seed. Work is needed to develop forecasting system for diseases. Eco-friendly management system needs to be developed leading to the integrated approach. The results obtained may assist in developing an integrated control program for these fungal diseases. More detailed investigations should be carried out on genetic and pathogenic variability of these pathogens.

ACKNOWLEDGMENTS

Author thanks Tepi National Spices Research Centre and Spices Program Research project for providing all the necessary facilities and support. I extend my sincere thanks to Debrezeit, Kulumsa and Sinana Agricultural Research Centre, spice program research team for their kind support during data collection.

REFERENCES

[1] Aminpour and Karimi 2004. Underutilized medicinal spices. Spice India. 17: 5-7.

[2] Ashraf M, Orooj A 2006. Salt stress effects on growth, ion accumulation and seed oil concentration in an arid zone traditional medicinal plant ajowan (*Trachypermum ammi* L. Sprague). J. Arid Environ., 64:209-220.

[3] Black M, Bewley D, Halmer 2005. The Encyclopedia of seed science, technology and uses. wallinoford. CAB P 7.

[4] Gaur M M 1949. Plant protection work in Ajmer Merwara in 1948 Plant Diseases. Plant Protection Bulletin Govt. of India 1:20-21.

[5] Hedberge I, Edwards S, SileshiNemomissa 2003. Flora of Ethiopia and Eriteria.4: 2, Apiaceae to Dipsaceae. The Natural Herbarium. Addis Ababa University, Addis Ababa and Uppsala. P. 21.

[6] Mogessie A and Tetemke M 1995. Some microbiological and nutritional properties of Borde and Shamita. Traditional Ethiopian fermented beverages. Ethiop. J. Health Dev. 9:105-110.

[7] Patel P N, Prasad N, Mathur R L and Mathur B L 1957. Fusarium wilt of cumin. Current Science 26: 181-182.

[8] Patel R M and Desai M V 197. *Alternaria burnsii* Blight of *Cuminum cyminum* and its control. Indian Phytopathology 24: 16-22.

[9] Shewaye L 2011. Antifungal Substances from Essential Oils. M.Sc. Thesis. Addis Ababa University. p. 8.

[10] Uppal B N 1930. Macrosporium blight of *Cuminum cyminum* in the Bombay Presidency. Internal Inst Agric Internal Bull Plant Protect 4.

[11] Uppal B N and Desai M K 1933. Cumin powdery mildew in Bombay. Bombay Dept Agric Bull 169: 1-16.

[12] Uppal B N, Patel M K, Kamat M N 1938. Alternaria blight of cumin. Indian Journal of Agricultural Sciences 8: 49-62.

Citation: *Merga Jibat, Wakjira Getachew ommit a, Habetewold Kifelew, Abukiya Getu.“ Survey and Identification of Black Cumin (Nigella Sativa L.) Disease in Ethiopia” International Journal of Research in Agriculture and Forestry, 5(11),pp 31-34*