

PREVALENCE OF DISEASES IN NAGA CHILLI AT SYLHET REGION

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Abstract

Naga chilli (*Capsicum chinense* Jacq.) is one of the most important spice crops in the Sylhet region. The present investigation was conducted at different farmer's field in the Sylhet region to assess the disease status and cultivated areas of Naga chilli. It is cultivated in Jaintiapur, Biswanath, Kamalgonj, Bahubal areas of greater Sylhet region. In the present study Jaintiapur, Biswanath and Kamalgonj areas were widely investigated. Six diseases were recorded on Naga chilli. These are leaf blight, wilt, dieback, stem rot, mosaic and leaf curl. Leaf blight and wilt were most prevalent in the field. Although large variation was found in disease incidence but severity level did not show much variation. Leaf blight showed the highest incidence (19.56%) compared to other diseases like wilt (17.71%), dieback (10%), leaf curl (3.33%), mosaic (10%) and the lowest was in stem rot (1%). In the early vegetative stage the prevalent diseases were leaf blight, wilt, mosaic, dieback, leaf curl and stem rot. In the late vegetative stage and fruiting stage leaf blight, wilt, leaf curl, dieback, mosaic diseases were mostly prevalent in the field. In Jaintiapur field the prevalent diseases were leaf blight, dieback, wilt, mosaic, leaf curl and stem rot. Mosaic, dieback and leaf blight diseases were mostly prevalent in farmer's field of Biswanath and Kamalgonj. To manage the diseases in the field farmers applied mostly Mancozeb, Sulfur fungicide, Triazole and Carbamate fungicides and sometimes they also applied micronutrient in the field to overcome diseases.

Keywords: Naga chilli, mosaic, disease incidence, disease severity, survey.

Introduction

Naga chilli (*Capsicum chinense* Jacq.) also known as Bhutjolokia, Ghost pepper, Ghost chilli, Bombaimarich, Red naga, Dorset naga etc. There are three distinct colours of fruit found in Bhutjolokia like red, dark red and orange. Due to high pungency it is recognized in the Guinness Book of world Record with a pungent level of 879,953 to 1,001,304 scoville heat units (SHU's) (Bosland and Bard, 2007; Ngullie *et al.*, 2010). It is an indigenous cultivar growing in Brahmaputra flood plain (Bhagowati and Changkija, 2009), Assam, Nagaland and Manipur and other part of North-eastern India (Kumar *et al.*, 2011). Naga chilli is grown successfully in Northeastern region of Bangladesh during Rabi season (Rashid, 1999). It has high export potential for its aroma, pungency, nutritive value and high capsaicin content. But the yield is not satisfactory due to unawareness of the growers on modern technology. Every year Naga chilli is exported to European markets (Hortex newsletter, 2009).

Though, being an important spice crop grown worldwide Naga chilli is vulnerable to several biotic stresses caused by virus, fungus and bacteria (Talukdar *et al.*, 2012). During the crop growth several diseases infect the plants. The most common diseases being dieback, anthracnose and leaf curl (Borgohain and Devi, 2007). In Assam the incidence of viral infection in Bhutjolokia was the highest (60%) as compared to fungal infection (10%) and bacterial infection (3%) (Talukder *et al.*, 2015). The Naga chilli is susceptible to different viruses such as cucumber mosaic virus (CMV), potato virus Y (PVY) (Talukder *et al.*, 2015, Baruah *et al.*, 2016) Tomato spotted wilt virus (TSWV), chilli leaf curl virus (ChLCV) (Borgohain and Devi 2007, Talukdar *et al.*, 2015, Baruah *et al.*, 2016) and Groundnut Bud Necrosis Virus (GBNV). The susceptibility of Naga chilli to chilli veinal mottle virus in Meghalaya is also noticed (Banerjee *et al.*, 2013). Many fungal diseases also affect Naga king chilli such as Anthracnose caused by *Colletotrichum capsici* and Die-back caused by *Colletotrichum gloeosporioides*, stem rot and wilt caused by *Sclerotia sclerotiorum*, Collar rot caused by *Rhizoctonia solani* and leaf spot caused by *Corynespora cassicola*. Bacterial disease caused by *Ralstonia solanacearum* is observed at later stages of crop grow. In Bangladesh Naga chilli is also affected by several diseases such as blight, wilt, die-back, mosaic and stunting.

Naga chilli is cultivated in the North-eastern regions of Bangladesh (Bhuyan *et al.*, 2015) specially in the greater Sylhet region. It is cultivated in Jaintiapur, Gowainghat, Biswanath, Kamalgonj, Bahubal etc. It is also cultivated in the middle of some lemon orchards in some areas of Kamalgonj upazila in rainy season to get the early market. No systematic

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work has been done on this economic crop. There is no report on the disease problems of Naga chilli. Therefore, information on the disease status of this crop is urgently needed. It will help farmers to increase yield and production of unblemished fruits. In view of above facts, the present study was undertaken to know the area of Naga chilli cultivation in the Sylhet region and to know the disease status of Naga chilli.

Materials and Methods

Experimental site and period

The present experiment was carried out at different farmer's field in Jaintiapur, Biswanath and Moulvibazar. The survey was conducted in selected Naga chilli cultivation areas from December 2017 to May 2018. Most of the plants were at fruit bearing stage during the survey.

Sampling and data collection

Selected plants (randomly 100 plants were selected/field) were inspected in an orderly manner, by walking around their perimeter examining the shoots, leaves and fruits for the symptoms of diseases. Also leaves and fruit that were fallen to the ground and the foliage and fruit in between trees for obvious unusual symptoms were observed. In each site at least three fields with each minimum 10 decimal size were chosen randomly for data collection. Data were collected for disease symptoms, severity, stage of the crop etc. For one location (Jaintiapur) data were collected from early vegetative stage, flowering stage and fruiting stage. For other locations only one visit was performed.

Disease incidence and severity

Disease incidence and disease severity was calculated according to the following formulae (Singh 2002)

$$\text{Disease Incidence (\%)} = \frac{\text{No. of infected plants}}{\text{Total no. of observed plants}} \times 100$$

$$\text{Disease Severity or PDI} = \frac{\text{Sum of total rating}}{\text{Total no. of plants observed} \times \text{highest grade}} \times 100$$

0-5 scale was followed for the calculation of PDI where 0= No disease, 1= 1-20%, 2= 21-40%, 3= 41-60%, 4= 61-80% and 5= 81-100% damage of the tissue (leaf, stem etc).

Results and Discussion

Cultivation areas of Naga chilli in Sylhet region

Cultivation areas of Naga chilli (*Capsicum chinense*) is shown in Table 1. Naga chilli is widely cultivated in Jaintiapur area. It is also cultivated in Biswanath, Moulvibazar, Habigonj, Kamalgonj. Farmer's grow this crop mainly in the winter season (rabi crop). The time of planting varies according to land type. The crop is transplanted from November to January but the total area under Naga chilli cultivation is not known. It needs to be estimated by a competent authority. Bhagowati and Changkija (2009) reported that Naga chilli is broadly cultivated in Brahmaputra flood plain, Assam, Nagaland, Manipur and other part of Northeastern India.

Table 1. Naga chilli cultivation areas in the Sylhet region

Place	Upazila	District
Dorbost	Jaintiapur	Sylhet
Kaligonj	Biswanath	Sylhet
Haripur	Jaintiapur	Sylhet
Chiknagul	Jaintiapur	Sylhet
Madhavpur	Kamalgonj	Moulvibazar
Bahubal	Bahubal	Habigonj

Source: DAE, BARI, Personal communication

Observation of Naga chilli diseases in different farmer's field

The studied area of Naga chilli were investigated carefully and a number of diseases were found available in the susceptible plant parts (Figure 1). The available diseases of naga chilli are presented in Table 2. Six diseases were recorded from field observation. From this study it was found that fungal diseases were predominant. Some bacterial and viral diseases were also prevalent in the field. Talukder et al. (2015) reported the prevalence of various virus

diseases occurring on ‘Bhut Jolokia’ in Assam. From their survey they indicated that in Assam viral diseases (60%) were more abundant than fungal diseases (10%) and bacterial diseases (3%). But in the present investigation fungal diseases were found to be more prevalent in Naga chilli than other diseases. Anthracnose is an important disease of chilli. But this disease was not found in any field of Naga chilli.

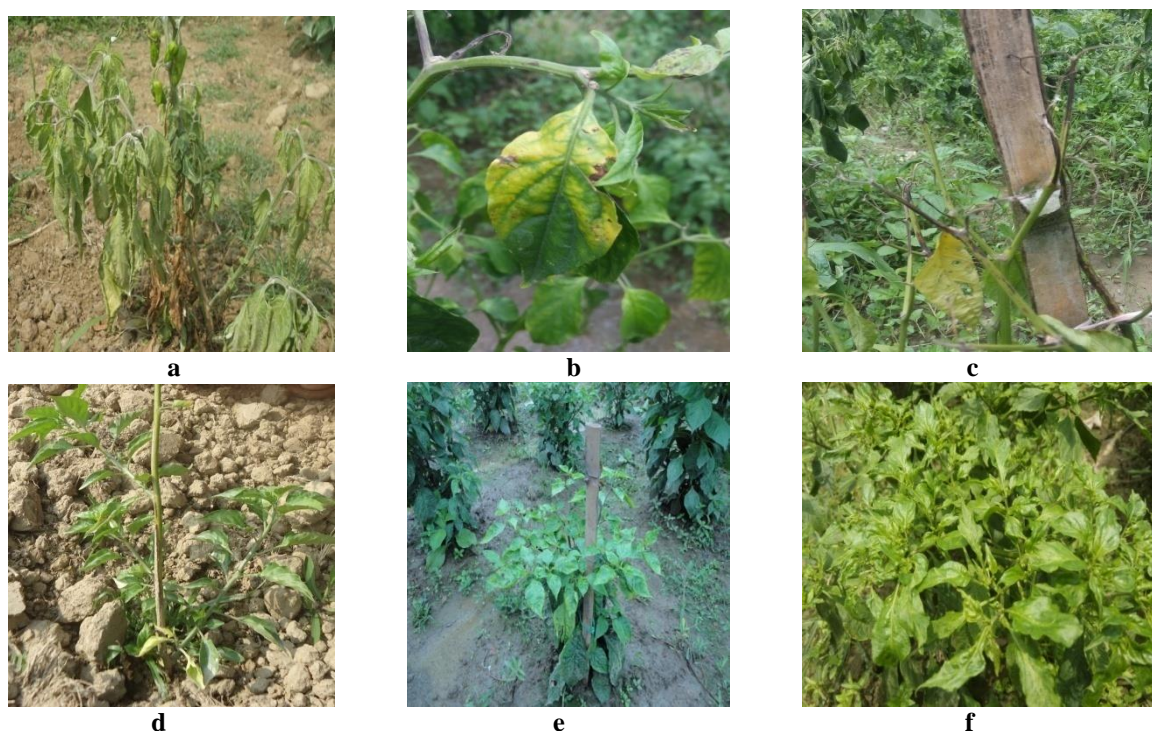


Fig. 1. Observation of different disease symptoms occurring in Naga chilli plant a) Wilt b) Leaf blight c) Dieback d) Stem rot e) Mosaic f) Leaf curl

Table 2. Diseases of Naga chilli observed in the field

Disease	Symptom	Possible causal agent
Leaf Blight	Rapid and complete chlorosis, browning of the leaves, branches and twigs causing death of the plant	<i>Alternaria</i> spp.
Wilt	Drooping of the foliage	<i>Fusarium</i> spp.
Dieback	Progressive dying of shoots from tip to the base of the plants	<i>Colletotrichum</i> spp.
Stem rot	Brown to black color lesions develop at the lower portion of the stem	<i>Ascochyta</i> spp.
Leaf curl	Leaf is curled and malformed	Chilli leaf curl virus (ChLCV)
Mosaic	Leaves are smaller, light green color, mosaic symptoms include mixture of light and deep green color, moderate to severe stunting occur and growth is hampered	Cucumber mosaic virus (CMV)

Incidence and severity of Naga chilli diseases in the field

Incidence and severity of Naga chilli diseases in different field are presented in Table 3. It is noted that leaf blight was found to be the most prevalent disease followed by wilt, dieback, leaf curl, mosaic and stem rot. The highest disease incidence (19.56%) was attributed to blight and the lowest incidence (1%) to stem rot. Disease severity was moderate in most of the diseases except stem rot. Naga chilli diseases are reported by several authors. They reported the diseases occurred in Naga chilli such as leaf curl, anthracnose (Borgohain and Devi 2007; Talukdar *et al.*, 2015), veinal mottle

virus (Banerjee *et al.*, 2013), dieback, stem rot, wilt, leaf spot, collar rot, leaf and stem necrosis and bacterial wilt (Talukdar *et al.*, 2015), damping off, root and stem rot (Ngullie and Daiho, 2013) and powdery mildew (Anamika, 2018). Chilli diseases are also reported by several authors such as ripe rot and anthracnose (Smith and Crossman, 1958), leaf spot and fruit rot (Mridha and Siddiqui, 1989), powdery mildew (Haneef *et al.*, 2017), tobacco mosaic virus (Holmes, 1960), pepper mosaic virus (Pal, 2002). Comparing the diseases both in Chilli and Naga chilli most of them are similar.

Table 3. Incidence and severity of Naga chilli diseases in the field

Diseases	Incidence (%)	Severity (1-4)
Leaf blight	19.56	2
Wilt	17.71	-
Dieback	10.00	2
Leaf curl	3.33	2
Mosaic	10.00	2
Stem rot	1.00	1

Incidence and severity of Naga chilli diseases at different plant growth stages

During investigation in several locations data were collected just once for all places but for Jaintapur data were recorded at three plant growth stages. Incidence and severity of Naga chilli diseases in the three stages are shown in Table 4. It was observed from that the maximum diseases with high incidence (17.76%) and severity were observed in early vegetative stage. The minimum incidence (15.8%) and severity were observed in fruiting stage. Results revealed that most of the diseases, its incidence and severity was reduced over time. Naga chilli plants are seemed to be susceptible to many diseases in the early stage. Anthracnose caused by *Colletotrichum* is an important disease of chilli fruits. But it was not observed in the Naga chilli field.

Table 4. Incidence and severity of Naga chilli diseases at different plant growth stages

Crop growth stages	Diseases	Incidence (%)	Severity (1-4)
Early vegetative stage	Leaf blight, Wilt, Dieback, Leaf curl, Mosaic	17.76	2
Late vegetative stage	Leaf blight, Wilt, Leaf curl, Dieback, Mosaic	15.9	2
Fruiting stage	Leaf blight, Wilt, Stem rot, Dieback, Leaf curl, Mosaic	15.8	1

Observation of Naga chilli diseases in different locations

There are several diseases of Naga chilli observed in different locations of Sylhet region. Disease incidence and severity of Naga chilli diseases in different locations are given in Table 5. The maximum number of diseases occurring in Jaintapur area with the highest incidence (48.74%) and severity. The minimum number of diseases occurring in Kamalgonj and the disease incidence (10%) was also the lowest. Moderate disease incidence (12%) was occurred in Biswanath. In Biswanath and Kamalgonj fields were observed only in the late fruiting stage. For this reason least diseases incidence (%) are reported in these locations.

Table 5. Incidence and severity of Naga chilli diseases in different locations

Location	Diseases	Incidence (%)	Severity (1-4)
Jaintapur	Blight, Wilt, Dieback, Mosaic, Leaf curl, Stem rot	48.74	2
Biswanath	Dieback, Mosaic, Blight	12.00	1
Kamalgonj	Mosaic, Dieback	10.00	2

Application of different pesticides by the farmers in the field

For reducing disease occurrence different types of pesticides were used by the farmers and these are presented in Table 6. The strobilurin fungicides azoxystrobin (Quadris), trifloxystrobin (Flint), and pyraclostrobin (Cabrio) have recently been recommended for the control of chilli anthracnose (Than *et al.*, 2008). Moreover, various fungicides have been found to be effective including 0.2% mancozeb, 0.1% ziram, Blitox 50, 0.1% Bavistin and 0.5% or 1% Bordeaux

mixture. However, there are numerous undesirable effects of using chemicals are reported on farmers income, the toxic effects of chemicals on farmers and other environmental concerns particularly in developing countries (Voorrips *et al.*, 2004).

Table 6. Use of different pesticides by the farmers in the field

Name of the fungicides	Group
Dithane M-45	Mancozeb
Microvit	Micronutrient
Cosavet	Sulfur fungicide
Asamil	Triazole
Kumulas DF	Sulfur fungicide/ Acaricide
Parzate	Carbamate
Indofil	Mancozeb

Naga chilli is found to be cultivated widely in Jaintiapur, Biswanath, Kamalgonj and Bahubal areas of greater Sylhet region. From the field survey it is found that at least six diseases like leaf blight, wilt, dieback, stem rot, mosaic and leaf curl are prevalent in Naga chilli. In the early stages of crop growth mostly fungal diseases are found but in the later stages viral diseases are predominant. Extensive survey for another one or two seasons are required to get an actual picture of the field. However, farmers use various pesticides or chemicals to prevent the crop loss from diseases. Indiscriminate use of such chemicals is causing pollution and loss to the farmers. Therefore, experiments are needed on disease management of Naga chilli to give proper suggestion to the farmers.

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