The Pharma Innovation Journal 2023; SP-12(11): 963-969

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(11): 963-969

www.thepharmajournal.com
Received: 01-09-2023
Accepted: 06-10-2023

Manjula
Department of Plant Pathology, Agricultural College, Bapatla, Andhra Pradesh, India

Patibanda AK
Professor and Head, Department of Plant Pathology, SMGR Agricultural College, Udayagiri, Nellore, Andhra Pradesh, India

Kishore Verma P
Principal Scientist, Department of Plant Pathology, RARS, Lam, Guntur, Andhra Pradesh, India

Manoj Kumar V
Professor, Department of Plant Pathology, Agricultural College, Bapatla, Andhra Pradesh, India

Sandhya Rani C
Professor, Department of Entomology, Agricultural College, Bapatla, Andhra Pradesh, India

Corresponding Author:
Manjula
Department of Plant Pathology, Agricultural College, Bapatla, Andhra Pradesh, India

Incidence and distribution of sugarcane Pokkah boeng disease in Vishakhapatnam district of Andhra Pradesh, India

Manjula, Patibanda AK, Kishore Verma P, Manoj Kumar V and Sandhya Rani C

Abstract
Sugarcane is the world's largest crop in terms of production and top most important cash crop. India placed in 2nd position among top five largest producer countries next to Brazil, which increasing the concern of researchers towards its protection against biotic and abiotic factors. Among the biotic factors affecting sugarcane, fungal pathogens are drastically affecting the crop economy by producing severe necrotic symptoms. Pokkah boeng is one of the recently emerged disease incited by *Fusarium* species complex. In this study to know the incidence, roving survey was carried out in a total of 15 villages from seven mandals of Vishakhapatnam district of Andhra Pradesh such as Anakapalle, Chodavaram, Kasimkota, Butchayyapeta, Cheedikada, Munagapaka during *Kharif* 2020. Highest disease incidence was recorded from the fields of Anakapalle (40% in variety 2001A 63 in its formative stage). Whereas, zero disease incidence was noticed in Gajapathinagaram (CoA 7602), Lakavaram (2007A 81), Jaithavaram (87A 298) and Munagapaka (2003V 46). Among the villages, two (Damunapalli and Chintalapalem) were severely, six (Thummapala, Anakapalle, Gajapathinagaram, Lakavaram, Polepalle and Tamaram) were moderately and seven (Cheedikada, Veduruparthi, Chinna Gogada, Bangarumetta, Moolapeta, Munagapaka, Jaithavaram) were recorded with mild incidence. Most of the isolates (F1- F20, excluding F14) recovered from symptomatic leaf samples were confirmed through cultural, morphological and molecular studies as *Fusarium sacchari* and one isolate (F14) deviated from the rest which was identified as *F. andiyazi.* Survey data have provided reliable, primary information regarding disease and its distribution in the local areas of Vishakhapatnam district which will throw light on the area of effective disease management in further.

Keywords: Pokkah boeng disease, percent disease incidence, sugarcane, pathogen distribution

Introduction
Sugarcane (*Saccharum officinarum* (L.)) is one of the most important commercial crops in India, extensively cultivated in tropical and subtropical region. India is the largest consumer and second largest producer of sugar in the world. Uttar Pradesh stands first in both area and production of sugarcane. It is contributing highest part of the income for sugarcane growing farmers. The crop is best suited for areas with medium soil fertility of sandy loam soil textures with a pH- range from 6.0 to 7.7. Decreased agriculture area under sugarcane in Andhra Pradesh (from 0.06 M ha in 2021 to 0.05 M ha in 2022) witnessing the stress experienced by the crop. Sugarcane encounters number of diseases during crop growth period that contribute to low yield and economic loss to the peasant and finally to the nation. Consistent yields were not reported and, in some seasons, a marked decline was reported due to its susceptibility to several fungal and viral diseases as well as pests. Large number of pathogens infecting sugarcane have been recorded all over the world. One of the current major diseases affecting sugarcane and sugar production is Pokkah boeng caused by *Fusarium* species complex, a destructive fungal disease in sugarcane-growing regions. This disease is associated with several other diseases of sugarcane such as sett rot, root rot, and wilt (Waraitch *et al.*, 1982) [9]. The pathogen is transmitted by air currents and airborne conidia colonize the leaves, flowers and stems of the plant. Pokkah boeng disease on sugarcane has been recorded in almost all countries where sugarcane is grown economically. This disease was originally described in Java in 1896, denoting a distorted or malformed top. Walker and Went (1896) [8] were the first to describe the Pokkah boeng disease on sugarcane.

Pokka boeng disease is dependent upon the environmental conditions, handling of the plants and quality of setts *e.g.*, exposing sugarcane plants to stress either from water stress, temperature, soil nutrition or pH. Hail damage can cause cane plants to be easily vulnerable to diseases due to the bruised stalks and broken leaves, giving the diseases access to the damaged setts. Some of the favourable conditions for disease development included drenched conditions of the soil, lack of cultural practices that result in the growth of weeds, constant cultivation of same variety in the field and existence of susceptible varieties in the surroundings. It is important for a farmer to prevent and control pests and diseases to avoid losses. *Fusarium* species complex can produce many kinds of toxic secondary metabolites known as mycotoxins, which can easily enter humans and animals through food and feed because of their resistance to milling, processing, and heating (Marasas *et al.*, 1991) [4].

In this study major sugarcane growing ares of Vishakhapatnam district of Andhra Pradesh, are centered to find the vast distribution of pathogens associated with sugarcane Pokkah boeng disease.

Materials and Methods

The present study investigated occurrence of Pokkah boeng disease of sugarcane in Visakhapatnam district in order to provide scientific reference for sugarcane variety distribution and disease occurrence.

A roving survey was carried out during *kharif* 2020-2021 in the months of September-October to assess the incidence and severity of Pokkah boeng disease in major sugarcane growing mandals of Visakhapatnam district of Andhra Pradesh. Relying on crop statistics of preceding year, seven mandals were chosen for survey. Based on the information, from each mandal two villages, in each village two fields were selected to record the incidence and severity of the disease. The area of sugarcane cultivation was visited with the help of sugarcane supervisors, sugar mill employees, sugarcane corporative committee members and farmers.

The disease incidence in each cultivar was recorded by counting the number of infected plants out of the total number of plants assessed per cultivar and was expressed in percentage.

Percent disease incidence for the disease was calculated by using the following formula:

$$\text{Disease incidence (\%)} = \frac{\text{Number of infected plants}}{\text{Total no. of plants assessed}} \times 100$$

Pokkah boeng disease was differentiated into three categories *viz*., mild, moderate and severe on the basis of symptoms observed in the field given by AICRP on sugarcane, Technical Report-Plant Pathology (2020-21), SBI, Coimbatore.

Mild: Green plants with Pokkah boeng (curling/twisting of spindle leaves, tearing of leaves, whitish /chlorotic streaks on the leaves) at varying intensities.

Moderate: Yellowing of 3rd or 4th top leaf followed by complete yellowing of foliage and expression of top rot symptom.

Severe: Yellowing of leaves and discolouration (light coloured) of stalks + wilting symptom in opened stalks.

Collection of diseased samples

The field visits in different mandals of Visakhapatnam district *viz.*, Munagapaka Chodavaram, Cheedikada, Anakapalle, Makavarapalem, Butchayyapeta and Kasimkota, were made between September and October months in the year 2020.

Table 1: Geographical location of Pokkah boeng infected samples collected from various mandals in Visakhapatnam district, Andhra Pradesh

S. No.	Place of collection of infected samples	Latitude and longitude
1	Anakapalle	17.69° N, 83.00° E
2	Chodavaram	17.83° N, 82.93° E
3	Kasimkota	17.67° N, 82.96° E
4	Butchayyapeta	17.79° N, 82.89° E
5	Cheedikada	17.92° N, 82.89° E
6	Munagapaka	17.64° N, 82.99° E
7	Makavarapalem	17.62° N, 82.72° E

The samples of Pokkah boeng disease that were exhibiting clear cut symptoms *viz.*, chlorosis, knife cut and top rot stages were collected and diseased specimens were wrapped in clean polythene bags, labelled properly and brought to the laboratory for isolation of the causal organism for further studies. A total of 20 samples collected from different locations during the survey were kept inside the refrigerator till isolation.

Isolation and Maintenance of Causal Organism

Identification of pathogen with moisture plate technique

Leaf samples collected from survey were brought to the laboratory for further assessment of the causal organism of Pokkah boeng disease. Petriplates placed with exact fit blotting paper were made wet by sprinkling sterile distilled water. Inside that moistened plate, a glass slide having small bit of diseased specimen was placed and closed the lid. This was kept under room temperature for 48 hrs. Later the mycelial growth on the slide was observed under microscope and captured the photographs of fungal morphology from different isolates such as micro and macroconidia, mycelial branching, phialide arrangement and septation *etc.* for initial confirmation of the pathogen identity.

Isolation of the Pathogen

All the samples collected during survey were brought to the laboratory for isolation of the pathogen. Infected plant parts were washed thoroughly in running water to remove dust particles and thereafter placed in between blotting paper to remove excess moisture, if any. The infected portion was critically observed for symptoms of disease.

The diseased parts of leaves and top rotted canes were cut with the help of sterilized blade and made into pieces (1 mm size) having half healthy and half diseased parts. These pieces

were dipped in 0.1% mercuric chloride solution for about one minute followed by two to three washings with sterilized distilled water and placed on blotter paper to remove excess moisture. The sterilized and melted medium was poured aseptically in sterilized Petriplates at the rate of 15 to 20 ml media per plate, approximately. The diseased tissues of Pokkah boeng fungus were picked up, surface sterilized with 1% sodium hypochlorite for 1 min. and washed twice with distilled water and transferred aseptically to previously sterilized potato dextrose agar (PDA) plates in laminar flow cabinet. The inoculated Petriplates were incubated at 28±1 °C for 4 days in BOD incubator and observed for cultural and morphological characters for genus confirmation. The fungus was sub cultured on the PDA slants and allowed to grow at 28±1 ℃ temperature for one week and later the culture was stored in refrigerator at 4 ℃ for further studies and was sub cultured periodically.

Identification of Pathogen through Microscopic Study

All the fungal culture isolates were identified on the basis of their cultural and microscopic characters. Cultural characters of isolates were observed and recorded from the mycelial colonies of the pathogen grown on Potato Dextrose Agar medium (PDA). Microscopic study was done by slides prepared in cotton blue stain and examined under compound microscope.

Results and Discussion

Symptomatology: Under field conditions symptoms were observed mostly on foliage. Initial symptoms of the disease showed chlorotic or whitish areas at the base of the young leaves (3rd or 4th leaf). Frequently, a pronounced twisting, curling and bending of spindle leaves from the top portion, yellowing of foliage with shot holes were noticed at later stage with varying intensities indicating malformed or damaged top in highly susceptible varieties. Top rot symptoms were observed in advanced stage of infection. The symptoms of knife-cut stage were observed in association with the acute (top rot) phase of the disease characterized by one or two or even more transverse cuts in the rind of the stalk /stem (Figure 1).

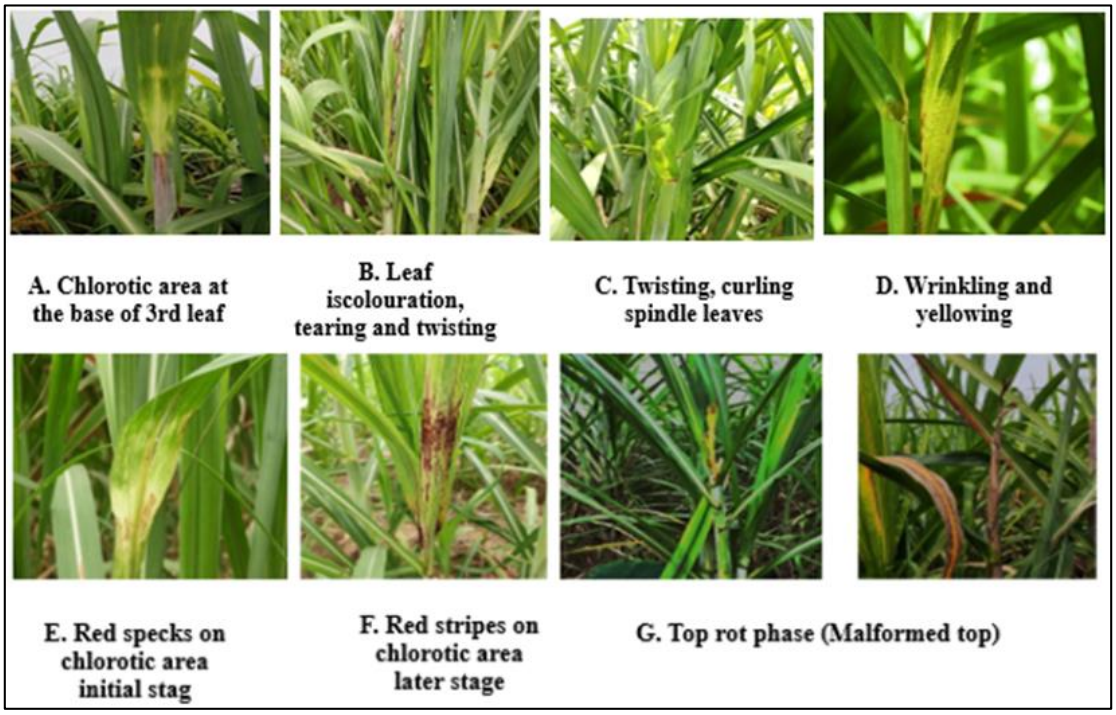


Fig 1 Peculiar symptoms of Pokkah boeng disease of sugarcane

Survey for the occurrence of pokkah boeng disease

A roving survey was conducted during *kharif* 2020-21 in Visakhapatnam district of Andhra Pradesh with special reference to the Pokkah boeng disease of sugarcane. Seven mandals were chosen for survey where sugarcane was grown as major commercial crop *viz.*, Anakapalle, Chodavaram, Kasimkota, Butchayyapeta, Cheedikada, Munagapaka and Makavarapalem. Interestingly these areas were involved in jaggery production and Anakapalle was positioned second in the country after Hapur in Uttar Pradesh and first in Andhra Pradesh regarding production of jaggery. Thus, it was necessitated to look on sugarcane crop which was severely infected with many plant diseases especially Pokkah boeng which was in-turn directly affecting the economy of the growers. As a first step towards diagnosing the causal agent of Pokkah boeng disease, leaf samples showing disease symptoms were collected from total of forty-four farmer fields of above mentioned mandals and some samples from Jami and Boila Kinthada villages to isolate the pathogen (Figure 1 and 2).

The average disease incidence was reported to be highest (17%) in Anakapalle and lowest (5%) in Cheedikada and Munagapaka among all the seven mandals surveyed. Chodavaram, Kasimkota, Makavarapalem and Butchayyapeta showed 16.66, 15, 12.5 and 9 percent average disease incidence, respectively (Figure 3, Table 2).

Results revealed that during *kharif* season, 2020-2021 the disease incidence was observed in the range 0 to 40 percent in the surveyed villages. Highest disease incidence was recorded in the fields of Anakapalle (forty percent disease incidence) with the variety 2001A 63 in its formative stage but it was not noticed (zero percent disease incidence) in some varieties like CoA 7602 in Gajapathinagaram, 2007A 81 in Lakavaram, 87A 298 in Jaithavaram and 2003V 46 in Munagapaka.

Highest mean disease incidence was reported in ratoon crop (23.75%) compared to plant crop which showed 10.37 percent average disease incidence. The disease incidence was also showed remarkable difference with respect to stage of the crop. In both ratoons planted and directly planted crop the average disease incidence was more in formative stage *i.e.*, 25.83 and 12.43%, respectively than in grand growth stage (21.66 and 9.3% average disease incidence, respectively). It was also reported less in grand growth to maturity stage *i.e.*, 9.38 percent in plant crop (Table 3).

Fig 2: Survey for the occurrence of Pokkah boeng disease of sugarcane

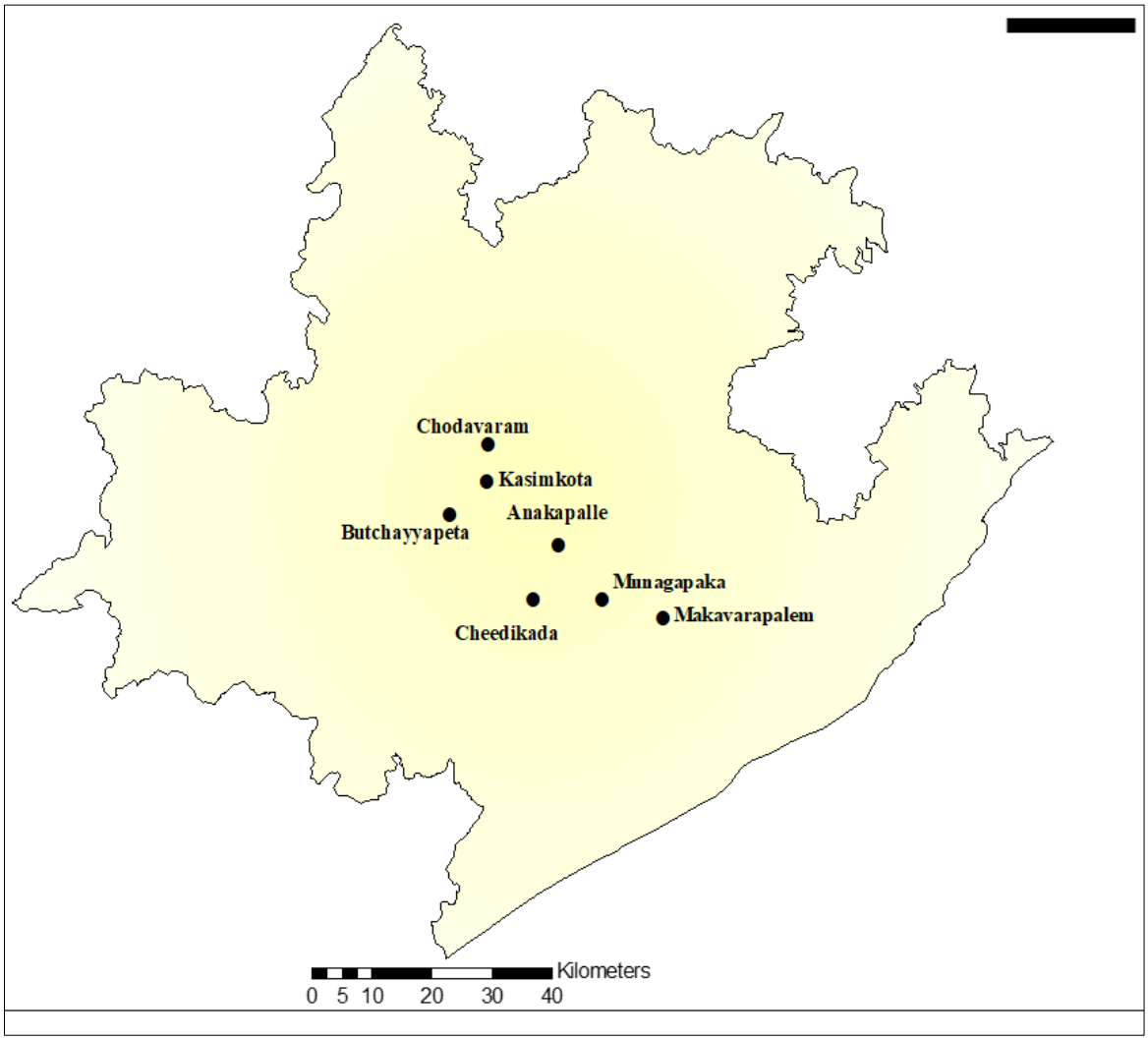


Fig 3: Percent incidence of Pokkah boeng disease of sugarcane in major sugarcane growing regions of Vishakhapatnam district of Andhra Pradesh

Table 2: Prevalence of Pokkah boeng disease incidence in Visakhapatnam district of Andhra Pradesh during *kharif*, 2020-2021

S. No.	Mandals	Place of visit (Village)	Variety	Crop stage	Pokkah boeng incidence (In percent)	Severity of symptoms	Madal average incidence (In percent)	Remarks
1	Anakapalle	Thummapala	87A 298	GGS	20	Moderate	17.00	Ratoon
			CoA 7602	FS	10	Mild		Plant crop
		Moolapeta	87A 298	FS	05	Mild		Plant crop
			2003V 46	FS	05	Mild		Plant crop
		RARS, Anakapalle	2009A 107	GGS-MS	15	Moderate		Plant crop
			CoA 7602	GGS	25	Severe		Ratoon
			2015A 230	GGS	20	Moderate		Plant crop
			87A 298	GGS	20	Moderate		Plant crop
			2009A 107	GGS	11	Moderate		Plant crop
			2001A 63	FS	40	Severe		Ratoon
			2009A 107	FS	23	Severe		Plant crop
			87A 298	FS	19	Moderate		Plant crop
			2015A 230	FS	14	Moderate		Plant crop
			CoA 7602	FS	11	Moderate		Plant crop
2	Chodavaram	Gajapathinagaram	87A 298	GGS	20	Moderate	16.66	Ratoon
			Co 62175	GGS	20	Moderate		Plant crop
			2009A 107	GGS	20	Moderate		Plant crop
			CoA 7602	GGS	00	-		Plant crop
		Lakavaram	2009A 107	GGS-MS	20	Moderate		Plant crop
			2007A 81	GGS	00	-		Plant crop
			CoA 7602	FS	20	Moderate		Ratoon
		Damunapalli	87A 298	FS	20	Moderate		Ratoon
			87A 298	FS	30	Severe		Ratoon
3	Kasimkota	Chintalapalem	2009A 107	FS	25	Severe	15.00	Ratoon
			87A 380	FS	20	Moderate		Ratoon
		Veduruparthi	2000A 56	GGS-MS	05	Mild		Plant crop
			87A 380	GGS	10	Mild		Plant crop
4	Butchayyapeta	Polepalle	CoA 7602	GGS-MS	15	Moderate	9.00	Plant crop
			81V 48	GGS	10	Mild		Plant crop
		Bangarumetta	2000A 56	GGS-MS	05	Mild		Plant crop
			2003V 46	GGS-MS	05	Mild		Plant crop
			2009A 107	GGS	10	Mild		Plant crop
5	Cheedikada	Cheedikada	87A 298	GGS-MS	05	Mild	5.00	Plant crop
			CoA 7602	GGS-MS	05	Mild		Plant crop
			Co 62175	GGS	15	Moderate		Plant crop
		Jaithavaram	87A 298	GGS	00	-		Plant crop
			87A 298	GGS	00	Mild		Plant crop
		Chinna Gogada	81V 48	GGS	05	Mild		Plant crop
6	Munagapaka	Munagapaka	87A 298	GGS	10	Mild	5.00	Plant crop
			81V 48	GGS	00	-		Plant crop
			81V 48	GGS	10	Mild		Plant crop
			2003V 46	GGS	00	-		Plant crop
7	Makavarapalem	Tamaram	2003V 46	GGS	10	Mild	12.50	Plant crop
			81A 99	GGS	15	Moderate		Plant crop

GGS**: Grand growth stage
FS*: Fomative stage
GGS-MS***: Grand growth to maturity stage

Table 3: Pokkah boeng incidence with respect to type of sugarcane crop and crop stage

Type of plant	Crop stage	Mean incidence (%)
Ratoon crop	GGS	21.66
	FS	25.83
	Mean	23.75
Plant crop	GGS-MS	9.38
	FS	12.43
	GGS	9.3
	Mean	10.37

Village-Wise Incidence of Pokkah Boeng Disease

Table 4: Village-wise incidence of Pokkah boeng disease in Visakhapatnam district of Andhra Pradesh during *kharif*, 2020-2021

S. No.	Village	Mean disease incidence (%)	Disease status
1	Damunapalli (Vi), Chodavaram (Ma)	25.00	Severe
2	Chintalapalem (Vi), Kasimkota (Ma)	22.50	Severe
3	RARS, Anakapalle	19.80	Moderate
4	Thummapala (Vi), Anakapalle (Ma)	15.00	Moderate
5	Gajapathinagaram (Vi), Chodavaram (Ma)	15.00	Moderate
6	Lakavaram (Vi), Chodavaram (Ma)	13.33	Moderate
7	Polepalle (Vi), Butchayyapeta (Ma)	12.50	Moderate
8	Tamaram (Vi), Makavarapalem (Ma)	12.50	Moderate
9	Cheedikada (Vi), Cheedikada (Ma)	08.33	Mild
10	Veduruparthi (Vi), Kasimkota (Ma)	07.50	Mild
11	Chinna Gogada (Vi), Cheedikada (Ma)	07.50	Mild
12	Bangarumetta (Vi), Butchayyapeta (Ma)	06.66	Mild
13	Moolapeta (Vi), Anakapalle (Ma)	05.00	Mild
14	Munagapaka (Vi), Munagapaka (Ma)	03.33	Mild
15	Jaithavaram (Vi), Cheedikada (Ma)	00.00	Mild

The average disease incidence was considered and disclosed in particular to each village (Table 4). Characterization of disease severity was based on disease severity scale given by AICRP on sugarcane, Technical Report-Plant Pathology (2020-21), SBI, Coimbatore. Out of fifteen villages surveyed, two villages (Damunapalli and Chintalapalem) were reported with severe incidence of Pokkah boeng disease (22.5 to 25.0 percent disease incidence), six villages such as Thummapala, Anakapalle, Gajapathinagaram, Lakavaram, Polepalle and Tamaram with moderate (12.5 to 19.8 percent disease incidence) level of Pokkah boeng incidence and seven villages with mild disease incidence (0 to 8.33 percent disease incidence).

Variety-Wise Incidence of Pokkah Boeng Disease

In seven mandals of the Visakhapatnam region surveyed, it was observed that about twelve sugarcane varieties namely 87A 298, CoA 7602, 2009A 107, 2015A 230, Co 62175, 2007A 81, 87A 380, 2012V 123, 81V 48, 2000A 56, 2003V 46 and 81A 99 were grown by the farmers. The results obtained for Pokkah boeng disease incidence were presented in the Table 5.

Table 5: Variety-wise incidence of Pokkah boeng disease in Visakhapatnam district of Andhra Pradesh during *kharif*, 2020-2021

Varieties	No. of fields	Mean Incidence (%)
2001A 63	01	40.00
2009A 107	07	17.71
Co 62175	02	17.50
2015A 230	02	17.00
87A 380	02	15.00
81A 99	01	15.00
87A 298	11	13.55
CoA 7602	07	12.29
81V 48	04	06.25
2003V 46	04	05.00
2000A 56	02	05.00
2007A 81	01	00.00

During *Kharif* 2020-2021, the average Pokkah boeng incidence in the sugarcane varieties grown ranged from 0.00 (2007A 81) to 40.00 (2001A 63) percent. Maximum average Pokkah boeng incidence (40.00%) was recorded on 2001A 63 variety followed by the varieties *viz.*, 2009A 107 (17.71%), Co 62175 (17.50%), 2015A 230 (17%), 81A 99 and 87A 380 (each 15%), 87A 298(13.55%), CoA 7602 (12.29%), 81V 48 (6.25%) and 5% of average incidence shown by 2000A 56 and 2003V 46 while no disease was reported from the variety 2007A 81 (Table 5).

The results unveiled that percent incidence of the disease varied to a great extent as it was influenced by the type of variety, growth stage of the crop, location in which they were grown and other weather parameters. The surveyed villages of seven mandalas within Visakhapatnam district were having not much variable GPS coordinates (Figure 3, Table 1) but showed highly variable disease status from mild to severe form.

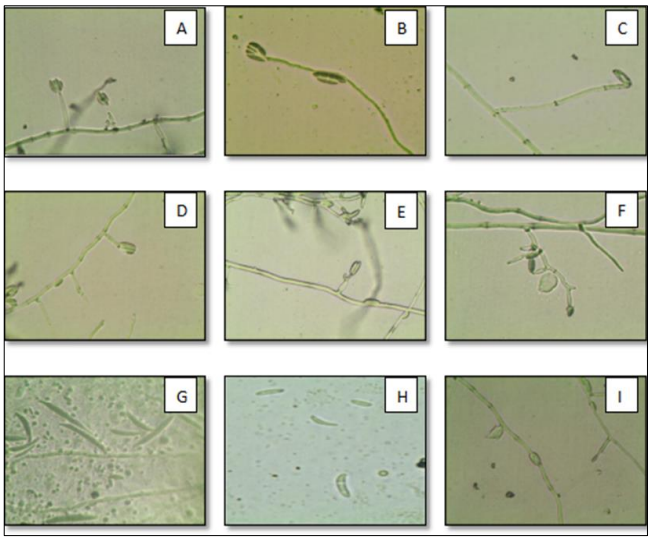
The present results corroborate with the findings of Singh *et al.* (2006) [5] who reported 0.1 to 10.0 percent Pokkah boeng incidence in prominent varieties such as CoS 767, CoS 802, CoS 8432, CoS 8436, CoS 88230, CoS 91269, CoS 95255, CoS 96258, CoS 97264 and CoPant 84212 in Uttar Pradesh during monsoon and post monsoon season. Vishwakarma *et al.* (2013) [7] reported 1-90 percent disease severity in Uttar Pradesh among the commercial cultivars whereas Karuppaiyan, *et al.* (2015) reported disease severity in a range of 6.9 to 25.30 percent in Haryana. Anuradha *et al.* (2019) [2] recorded 9-10 percent disease incidence from ratoon crop of variety Co 0238 in Doaba area of Punjab during May-June for the prevalence of Pokkah boeng disease.

High disease incidence (15-30%) in sugarcane cultivars, CoA 14321 (2009A 107), CoA 05323 (2000A 225) and 2012V 123 was reported at formative stage from Jami and Seethanagaram villages of Vizianagaram district and Kallamvaripalem of Krishna district, respectively (Varma *et al*., 2020) [2].

The disease severity was found to be higher in ratoon crop compared to the plant crop. Variability in cultivar susceptibility to Pokkah boeng disease was clearly noticed during the survey. Disease incidence was observed in the sugarcane variety, 2009A 107, irrespective of the location surveyed and the variety, 2007A 81 was found free of the disease. Pokkah boeng incidence was found high during formative stage and gradually reduced in grand growth stage and mostly confined to water shoots towards harvesting stage. Therefore, relatively high disease severity may be attributed to the sugarcane variety cultivated, stage of the crop, climatic condition of the area surveyed, cropping pattern and the cultural practices followed that favour survival and multiplication of the pathogen.

Pathogen Confirmation

The diseased samples collected from the surveyed villages were kept under observation for the pathogen confirmation. The samples assessed through moisture plate technique which revealed association of *Fusarium* spp. with Pokkah boeng disease samples as identified due to the presence of micro and macroconidia, mycelial branching, phialide arrangement, septation *etc* (Figure 4). A total of 20 *Fusarium* isolates were isolated from the diseased samples during survey, which are presented in table 6.



A-D: Monophialidic microconidia, E-F: Polyphialidic conidia, G: Macroconidia, H: Microconidia, I: Pseudo chlamydospore

Fig 4: Morphology of macro and micro conidia and conidiogenous cells of *Fusarium* isolates at 100X magnification

Table 6: List of *Fusarium* isolates obtained during survey and their source

S. No.	Isolates	Variety	Location
1	F 1	87A 298	Anakapalle
2	F 2	2009A 107	Anakapalle
3	F 3	81A 99	Tamaram
4	F 4	2015A 230	Anakapalle
5	F 5	Co 62175	Cheedikada
6	F 6	87A 298	Thummapala
7	F 7	Co 62175	Gajapathi Nagaram
8	F 8	CoA 7602	Lakavaram
9	F 9	Co 86032	Jami
10	F 10	87A 298	Anakapalle
11	F 11	2009A 107	Anakapalle
12	F 12	87A 298	Damunapalli
13	F 13	CoA 7602	Polepalle
14	F 14	CoA 7602	Anakapalle
15	F 15	2009A 107	Anakapalle
16	F 16	2001A 63	Anakapalle
17	F 17	87A 298	Munagapaka
18	F 18	2009A 107	Anakapalle
19	F 19	Co 7706	Boila Kintada
20	F 20	2009A 107	Gajapathi Nagaram

All the *Fusarium* isolates further characterized through cultural, morphological and molecular analysis and confirmed as *Fusarium sacchari* (F1 to F 20 excluding F14) and *F. andiyazi* (F 14)

Conclusion

This study emphasized the importance of the disease in terms of its incidence and distribution in and around Vishakhapatnam district of Andhra Pradesh. The disease severity was found to be higher in ratoon crop compared to the plant crop. Variability in cultivar susceptibility to Pokkah boeng disease was clearly noticed during the survey. Disease incidence was observed in the sugarcane variety, 2009A 107, irrespective of the location surveyed and the variety, 2007A 81 was found free of the disease. Pokkah boeng incidence was found high during formative stage and gradually reduced in grand growth stage and mostly confined to water shoots towards harvesting stage. Therefore, relatively high disease severity may be attributed to the sugarcane variety cultivated, stage of the crop, climatic condition of the area surveyed, cropping pattern and the cultural practices followed that favour survival and multiplication of the pathogen. Survey data have provided reliable, primary information regarding disease incidence and its distribution in the local areas of Vishakhapatnam district which will throw light on the area of effective disease management in further.

References

1. AICRP on sugarcane, Technical Report Plant Pathology. SBI, Coimbatore; c2020-21.
2. Anuradha, Kumar R, Kaur P, Kashyap L, Sanghera GS, Singh P, *et al*. Survey and surveillance of sugarcane diseases in Punjab, India. Agriculture Research Journal. 2019;56(2):345-347.
3. Karuppaiyan R, Bakshi R, Ramdiya S, Masawwar A, Meena MR. The incidence of Pokkah boeng in indigenous and exotic sugarcane (*Saccharum officinarum*) clones. Indian Journal of Agricultural Science. 2015;85(4):596-601.
4. Marasas WFO, Thiel PG, Sydenham EW, Rabie CJ, Lübben A, Nelson PE, *et al*. Toxicity and moniliformin production by four recently described species of *Fusarium* and two uncertain taxa. Mycopathologia. 1991;113(3):191-197.
5. Singh A, Chauhan SS, Singh A, Singh SB. Deterioration in sugarcane due to Pokkah boeng disease. Sugar Technology. 2006;8:187-190.
6. Varma PK, Vani CS, Kumar PP, Chandrasekhar VC, Bharathalakshmi M. Survey for Sugarcane Diseases in Major Sugarcane Growing Areas of Andhra Pradesh, India. International Journal of Current Microbiology and Applied Science. 2020;9(8):1865-1873.
7. Vishwakarma SK, Kumar P, Nigam A, Singh A, Kumar A. Pokkah Boeng: An Emerging Disease of Sugarcane. Journal of Plant Pathology and Microbiology. 2013;4(170):2.
8. Walker JH, Went FAFC. Overzicht van de ziekten van het suikerriet op Java. Arch. Suikerind. Ned.-Indie. 1896;4:425-435.
9. Waraitch KS, Kumar B. Pathogenic behaviour and varietal performance of *Fusarium* causing sugarcane wilt. Indian Sugar. 1982;32:317-320.