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## SURVEY ON RED ROT DISEASE OF SORGHUM IN CHITTOOR DISTRICT OF ANDHRA PRADESH



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### ABSTRACT:

Sorghum is the fifth most important cereal crop. It is used to prepare syrup, ethanol production, beer, biscuits etc, and making agro based industrial crop also. When the Sorghum plant suffers from red rot disease (Anthracnose), it leads to maximum yield loss. The present studies attempts to find out area and disease incidence in Chittoor district of A.P.



Aruna Kumari M

based industrial crop. Its alternate uses are animal feeds, poultry feeds and alcohol. The crop is genetically suited to hot and dry agro-ecologies where it is difficult to grow other food grain crops. Sorghum is truly a dual purpose crop where both grain and Stover are highly valued products. In larger parts of the developing world,

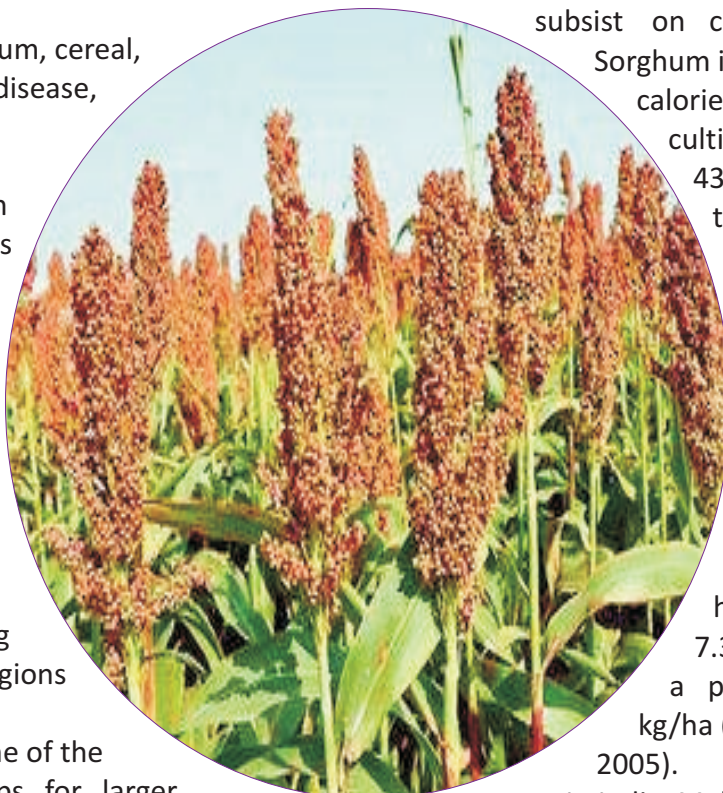
Stover contributes up to 50 percent of the total value of the crop. Among the rural people who

**KEY WORDS:** Sorghum, cereal, production, red rot, disease,

### INTRODUCTION:

Sorghum (*Sorghum bicolor* (L.) Moench) is the fifth most (after wheat, rice, maize and barely) important cereal crop grown by small farmers in the semi arid tropics (Rachie, 1970). It is the staple food crop for millions of poor people throughout the semi-arid regions of the world.

Sorghum (Fig. 1) is one of the important food crops for larger section of people in Asia and Africa and also a good source of fodder for cattle. It is used to prepare syrup, ethanol production (bio-fuel), beer, biscuits etc., and making it as an agro



Sorghum is the main source of calories. The Sorghum is cultivated over an area of 43.5 million hectares in the world producing 55.8 million tones of grain with a productivity of 1.3t/ha (Anon, 1995). India is the second largest producer of Sorghum crop in the world with an area of 9.49 million hectares producing 7.33 million tonnes with a productivity of 772 kg/ha (Seetharama et al., 2005).

In India, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu are the five Sorghum producing states which together account for about 86 percent of the area and 90

percent of the total production (Anon 1997).

The introduction of high yielding varieties of Sorghum in the 1970's helped to increase the yield per hectare. To meet out the escalating food requirements continuous improvement in productivity, stability and sustainability is the today's necessity. But the causes of concern due to biotic stresses as a result of the introduction of improved hybrids and high yielding varieties have become the major impediment in achieving the targets.

### **Uses of Sorghum**

Sorghum is used for food, fodder, and the production of alcoholic beverages. It is an important food crop in Africa, Central America and South Asia. Sorghum is perfectly safe and is suitable for people of all ages and especially for people that are lactose tolerant. Sorghum is a whole food and can be eaten for breakfast, lunch and supper.

Sorghum is a principal source of energy protein, vitamins and minerals for millions of the poorest people in the region where it is cultivated. The majority of the carbohydrate in Sorghum is Starch, while soluble Sugar, pentans, cellulose, and hemi cellulose are low. Sorghum is a good source of fiber, mainly the insoluble (86.2%) fibre. The protein content is nearly equal and is comparable to that of wheat and maize.

Nutritionally, grain Sorghum is comprised of 11.3% protein and 3.3% fat. Like other cereals, Sorghum is predominantly starchy. The average starch content of Sorghum ranges from 56 to 73%. The chemical nature of the starch is a factor that affects its digestibility.

### **Red rot (Anthracnose) disease**

The red rot (Anthracnose) disease of Sorghum is caused by *Colletotrichum graminicola* (=sublineolum). The anthracnose fungus damages foliage and stems of grain Sorghum plant (*S. bicolor* ssp. *bicolor*). On susceptible hybrids, the stem holding the head (peduncle) becomes infected and brown sunken area with distinct margin develops when infected stems are cut lengthwise with a knife, one can see that the penetrated soft pith tissue and caused brick-red discoloration. This peduncle infection inhibits the flow of water and nutrients to the grain causing poor grain development.

The fungus also invades individual grains and the small branches of the particle. Rapid and severe yield loss can result from particle and peduncle infection.

**Figure 1: Sorghum crop in the field**







## MATERIAL AND METHODS

### Survey on Red Rot Disease of Sorghum

For studies on the occurrence of Red rot, surveys were conducted in Chittoor District of Rayalaseema Region of Andhra Pradesh to observe the parameters of area, production and the intensity of disease incidence of Anthracnose (it is also called Red Rot disease) of Sorghum that is caused by *Colletotrichum graminicola* (=sublineolum) for five consecutive years i.e., from 2005-2009. Area and production particulars of Sorghum were taken from the Agricultural statistics and economics. Three Mandals in the Western parts of the District i.e., Kuppam, Gudupalle and Ramakuppam Mandals in which Sorghum crop was grown purely under rain fed conditions and three Mandals were taken in the low rainfall area of the District i.e., Piler, K.V.Palle and Rompicherla.

In each condition observations were recorded about the area of the Red rot incidence and Time of Red rot occurrence, and the period in which severity was high and the loss in yields due to Red rot of Sorghum was recorded. The above observations were made during Kharif seasons.

The survey on Red Rot of Sorghum disease in Chittoor District by conducting field trips, the following observations was recorded.

- Time of sowing in Kharif and Rabi seasons in the Eastern and Western
- Mandals of Chittoor district.
- Time of emergence of disease
- Stage in which the disease incidence was high
- Weather conditions that affect the Red rot incidence
- Trends in area of cultivation for the three consecutive years from 2006-2009.

In Western parts of the district, maximum Sorghum area cultivated Mandals of Krishnadasarapalle village of Kuppam Mandals, G.N. Puttur of Ramakuppam and Vijalapuram village in Gudupalle Mandals were selected to record the observations and the field trips were conducted in the second fortnight of June i.e., Sowing period in Kharif season and Second field trip was conducted in the month of August in which the Red rot incidence was observed initially, Third field trip was conducted in the month of October, where the crop was at reproductive stage and also the disease incidence was

high. Likewise field trips of three villages from low rainfall areas in which Vepulabilu village of Piler, Vagalla village of K.V.palle Mandals and in Rompicherla Mandals, Bommaiahgari palle were also observed and recorded. These observations were recorded for five consecutive years from 2005 to 2009. Observations of the Red Rot disease in all the Sorghum growing Mandals were made at random intervals at random places.

### RESULTS AND DISCUSSION

The results on the survey on Red rot of Sorghum In Chitoor district, Sorghum is fourth cereal crop grown after Rice, Ragi and Bajra. The cultivated area was gradually decreasing year by year from 2004 to 2009. The total cultivated area in 2004 was 2785 hectares whereas it was 1422 hectares in 2007 – 2008 (Table 1). The area was decreased more than 50%. More than 75% of the area was in the Western Mandals of the district. The crop was grown in rain fed conditions where the soils were poor, less fertile and the annual rainfall was 750mm per annum. In Chitoor district, highest Sorghum area was cultivated in Kuppam Mandals followed by Gudupalle and Ramakuppam Mandals. In Chitoor district Sorghum crop was grown in 50 Mandals and nearly 50% of the Jowar crop was used as a fodder to cattle, because it has more nutritive value, where the cattle population was high in the district, and ranks first in the state (Table 1).

#### Survey of Red Rot disease incidence in Chitoor district

Field trips were conducted in three Mandals of western parts of Chitoor district where maximum Sorghum area was grown. In each Mandals one village was selected. They were Krishnadasarapalle of Kuppam Mandals, O.N. Puttur of Gudupalle Mandals & Vijilapuram village of Ramakuppam Mandals. In these Mandals the following observations were recorded.

- Normal rainfall was above 800mm/annum
- Sowing normally carried out in June first fort night, July first fort night.
- 90% of the farmers were not following the seed treatment.
- Crop was grown either intercrop, mixed crop or mono crop.
- The Red rot incidence was observed initially in the month of August in the vegetative phase.
- The Red rot disease was observed in almost all Sorghum areas of Mandals.
- Severity of disease incidence was more during reproductive phase of the crop in the months of October & November.
- Initially the disease was observed in the mid-rib of the leaves and spread towards lamina and other parts of the plants.

These selected villages of respective Mandals were visited three times during Kharif season in three consecutive years from 2006 to 2008 first at the time of sowing, second at the time of initiation of Red rot disease in the month of August and third at the time of reproductive stage during October and November.

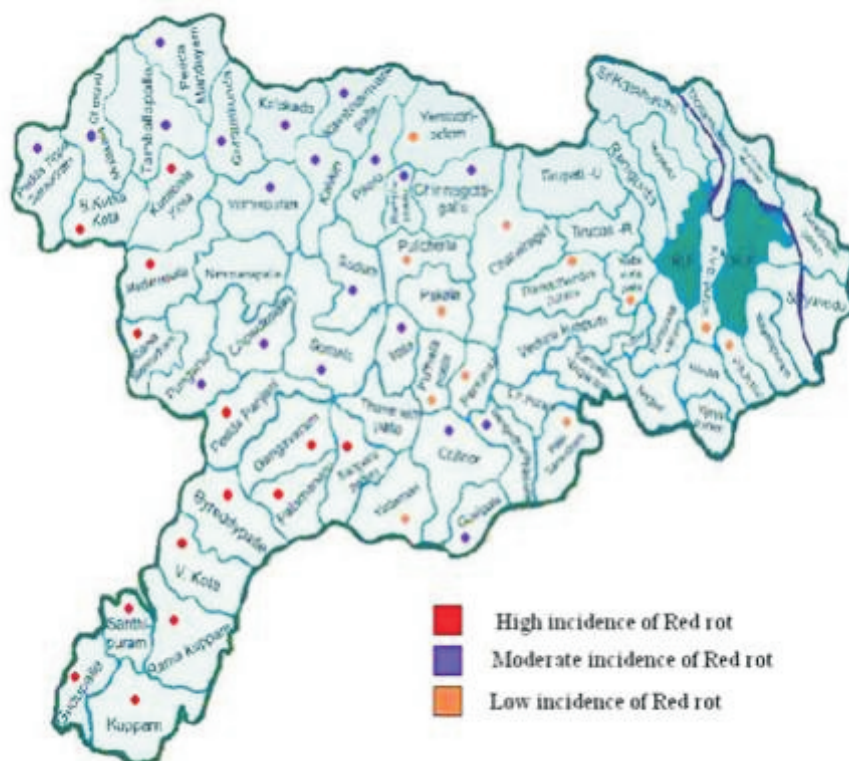
The intensity of disease incidence was varied from year to year. In the year 2008 Kharif the Red rot incidence was more in Kuppam region when compared to other two years, this may be due to continuous rains at the reproductive phase. It is also observed that during the dry weather the disease incidence was low. It also observed that the disease incidence was low in intercropping or mixed cropping when compared to mono cropping. This may be due to the plants get more aeration, sunlight & space. So this may be a reason for the less incidence of Red rot (Table 2; Fig. 2).

**SURVEY ON RED ROT DISEASE OF SORGHUM IN CHITTOOR DISTRICT OF ANDHRA PRADESH**

Field trials were also conducted in three Mandals, where the rainfall was less than 750mm and the temperature is between 25oc to 35oc during Kharif season. Visited one at vepulabilu of Piler Mandals, second at Vagalla village of Khambamvari Palle Mandals and Bommaiahgari palle of Rompicherla Mandals for three times, first at the time of sowing ,Second at disease initiation stage and third during reproductive phase of crop. Here also the crop is grown on purely under rain fed conditions. Seed treatment was not followed by any farmer. Here the Sorghum crop was grown mainly for fodder purpose rather than grain purpose. Disease incidence was moderate in the three Mandals when compared to Kuppam, Gudupalle and Ramakuppam Mandals (Table 2; Fig. 2).

Visited the entire 66 Mandals of Chittoor district at random. The Red rot disease was observed in almost all the Sorghum growing areas where the disease was moderate to severe.

**Survey on Red rot of Sorghum in Chittoor district**



**Map showing Red rot incidence in Chittoor district (Fig.2).**

**Statement showing Mandals-wise Jowar growing area over 4 years from 2004-05 to 2007-08 in Chittoor district (Table-1).**

Sl. No	Name of the Mandals	Jowar growing area in hect					
		2004	2005	2006	2007	Total	Average
1.	B.Kothakota	26	24	20	16	86	21.5
2.	Baireddipalle	8	9	5	7	29	7.25
3.	Bangarupalem	16	12	28	14	70	17.5
4.	Buchinaidu khandriga	0	0	0	0	0	0
5.	Chandragiri	3	4	4	6	17	4.25
6.	Chinnagottigallu	6	4	5	4	19	4.75
7.	Chittoor	7	4	6	5	22	5.5
8.	Chowdepalle	6	5	4	3	18	4.5
9.	Gangadhara nellore	2	1	4	7	14	3.5
10.	Gangavaram	15	14	10	11	50	12.5
11.	Gudipala	25	7	19	16	67	16.75
12.	Gudupalle	344	218	292	294	1148	287
13.	Gurramkonda	40	16	12	14	82	20.5
14.	Irala	4	35	12	14	65	16.25
15.	K.V.B.Puram	2	1	2	1	6	1.5
16.	Kalakada	5	5	4	3	17	4.25
17.	Kalikiri	6	4	3	4	17	4.25
18.	Kambhamvaripalle	8	6	6	5	25	6.25
19.	Kuppam	577	805	432	424	2238	559.5
20.	Kurabalakota	7	8	7	15	37	9.25
21.	Madanapalli	10	29	6	15	60	15
22.	Mulakalacheruvu	75	118	48	26	267	66.75
23.	Nimmanapalle	2	3	3	4	12	3



**SURVEY ON RED ROT DISEASE OF SORGHUM IN CHITTOOR DISTRICT OF ANDHRA PRADESH**

24.	Pakala	3	5	2	1	11	2.75
25.	Palamaner	6	5	4	3	18	4.5
26.	Palasamudram	9	11	4	10	34	8.5
27.	Peddamandyam	200	102	42	35	379	94.75
28.	Peddapanjani	8	6	4	3	21	5.25
29.	Peddathippasamudram	446	51	68	61	626	156.5
30.	Penumuru	4	2	4	2	12	3
31.	Pileru	8	6	4	5	23	5.75
32.	Pitchatur	0	0	1	0	1	0.25
33.	Pulicherla	10	10	16	8	44	11
34.	Punganur	27	29	25	3	84	21
35.	Puthalapattu	3	4	2	2	11	2.75
36.	Ramachandrapuram	2	1	2	1	6	1.5
37.	Ramakuppam	206	201	110	112	629	157.25
38.	Ramasamudram	31	25	20	16	92	23
39.	Renigunta	1	0	0	0	1	0.25
40.	Rompicherla	3	3	2	2	10	2.5
41.	Santhipuram	171	151	132	112	566	141.5
42.	Sodam	6	8	6	4	24	6
43.	Somala	8	4	6	4	22	5.5
44.	Srirangarajapuram	8	8	6	6	28	7
45.	Thamballapalle	324	130	64	49	567	141.75
46.	Vadamalapeta	2	4	1	1	8	2
47.	Valmikipuram	6	4	6	4	20	5
48.	Venkatagirikota	63	56	48	46	213	53.25
49.	Yadamari	32	27	23	22	104	26
50.	Yerravaripalem	4	3	2	2	11	2.75
<b>Total</b>		<b>2785</b>	<b>2188</b>	<b>1536</b>	<b>1422</b>	<b>7931</b>	<b>1982.8</b>

**STATEMENT SHOWING SEVERITY OF RED ROT INCIDENCE IN CHITTOOR DISTRICT (A.P.) (Table-2).**

SL. NO	MANDALS OF HIGH INCIDENCE	MANDALS OF MODERATE INCIDENCE	MANDALS OF LOW INCIDENCE
1.	B.Kothakota	Chinnagottigallu	Chandragiri
2.	Baireddipalle	Chittoor	K.V.B.Puram
3.	Bangarupalem	Chowdepalle	Pakala
4.	Gangavaram	Gangadhara Nellore	Palasamudram
5.	Gudupalle	Gudipala	Penumuru
6.	Kuppam	Gurramkonda	Pitchatur
7.	Kurabalakota	Irala	Pulicherla
8.	Madanapalli	Kalakada	Puthalapattu
9.	Palamaner	Kalikiri	Ramachandrapuram
10.	Peddapanjani	Kambhamvaripalle	Renigunta
11.	Ramakuppam	Mulakalacheruvu	Srirangarajapuram
12.	Ramasamudram	Peddamandyam	Vadamalapeta
13.	Santhipuram	Peddathippasamudram	Yadamari
14.	Venkatagirikota	Pileru	Yerravaripalem
15.	--	Punganur	--
16.	--	Rompicherla	--
17.	--	Sodam	--
18.	--	Somala	--
19.	--	Thamballapalle	--
20.	--	Valmikipuram	--

The Red rot of Sorghum caused by *Colletotrichum graminicola* (= *Colletotrichum Sublineolum* – Henn. Kabat et Bub.) is one of the vital diseases that affects sizeable reduction in yields of Sorghum grain. The current investigation includes survey on red rot areas affected with in Chittoor district of Andhra Pradesh. The survey was conducted to assess the severity and distribution of Red rot disease on Sorghum in Chittoor district of Andhra Pradesh (Fig. 2). Survey of the disease provides the information about the intensity that affected the yields and fodder in addition it will be a source of information on severity and economic importance of disease in relation to environmental conditions in different parts of the district. Leaf Red rot of Sorghum was observed during Kharif season for a consecutive periods of

three years from 2007 to 2009 (Table 1). In Kuppam, Ramakuppam and Gudupalle Mandals, where the Sorghum was grown extensively. The rainfall here was above 800mm per annum and also the Red rot of Sorghum was observed in three Mandals of Piler, Khambamvari Palle and Rompicherla where the rainfall was less than 750mm per annum. The survey revealed that the disease incidence was varying from Mandals to Mandals. It may be due to cultivation of different varieties, diverse environmental conditions prevailing over the locality. The results revealed that, the anthracnose disease (Red rot) was more severe in Kuppam, Ramakuppam and Gudupalle Mandals. It may be due to suitable environmental conditions like, rainfall, temperature and relative humidity prevailing which favored the disease development in the above Mandals (Fig. 2; Table 1).

The same reports were reported by Lenne, 1992 stating that environmental factors play major role in the development of Colletotrichum diseases. Temperature, humidity effects the disease development (Rotem et al., 1978; Royle and Butler, 1986). Mist or dew can also play an important role in extending the period of wetness following rainfall and may be important in increasing the rate of lesion spread (Dodd et al., 1992).

The results showed that, the disease was low in Piler, Khambamvari Palle and Rompicherla Mandals. It may be due to low rainfall, less humidity and high temperature when compared to Kuppam region of the district. The observations were in accordance with the earlier studies conducted by Leonord (1974). Naugi et al., (2002) conducted survey to assess the prevalence and severity of Sorghum anthracnose in 91 and 109 farmer fields. The most common foliar disease observed was anthracnose with prevalence ranging from 44 to 65 per cent. Rajasab and Frederiksen (2001) conducted survey in Sorghum growing regions of Karnataka and Maharashtra in 174 fields. The prevalence and severity of the anthracnose disease was most common in both the states. Mbwaga et al., (1993) noticed foliar disease like grey leaf spot, anthracnose, rust, sooty stripe and zonate leaf spot were in high frequency.

The present investigation on Sorghum growing areas in Chittoor district revealed that the Sorghum crop grown in almost all the Mandals of the district. But the crop was grown extensively in the Western parts of the district under rain fed conditions; where the majority of the crops grown under rain fed conditions due to lack of major irrigation sources. The Sorghum area was low in Eastern parts of the district where most of the crops were grown in assured irrigation.

Based on the data collected from Statistics and Economics department for a period of four years from 2006 to 2010, the data revealed that the area of Sorghum was gradually decreasing from year to year (Table 1). The reasons for this may be due to rise in literacy rate, improvement in economic conditions of the people and due to improvement in agro technology.

### SUMMARY AND CONCLUSION

Sorghum is the fifth most important cereal crop grown by small farmers in the Chittoor district of Andhra Pradesh. Among the foliar diseases, Red rot (anthracnose) caused by *Colletotrichum graminicola* Red rot is one of the most important diseases which infect foliage, stem, panicle and grains that leads to maximum yield loss. The present studies attempts to find out area and disease incidence in Chittoor district of Andhra Pradesh.

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