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INFLUENCE OF DIFFERENT SOWING DATES ON THE INCIDENCE OF SUNFLOWER NECROSIS DISEASE

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SUMMARY

A new sunflower necrosis disease (SND) caused by a strain of Tobacco Streak Virus (TSV) creates epiphytotics in many sunflower-growing states in India since 1996-97. A survey has revealed that its incidence ranged from 30 to 100% in production fields.

The disease being new, sources of resistance are still under investigation. Presently, use of imedacloprid insecticide has been advocated to combat the disease.

Effect of different sowing dates on incidence of necrosis disease was studied at ORS, Latur, during 1999-2001. The data revealed that the sunflower sown in July and August had high necrosis incidence. Changes in sowing period may help in combating disease incidence.

Key words: sunflower, necrosis disease, TSV strain, sowing period, disease incidence.

INTRODUCTION

Oilseeds form the second largest agricultural commodity after cereals in India. Amongst the oilseeds, the sunflower crop, though it is of recent introduction in India, has assumed popularity amongst farmers. It is now being grown at 27 lakh hectares with 15 lakh tons of production (Damondaram and Hegde, 2000). Amongst the Indian sunflower growing states, the Maharashtra is the third largest. But, in this state, sunflower is restricted to only one region i.e., Marathwada, where it is grown at 3.90 lakh hectares with 2.45 lakh tons of production.

As regards the sunflower disease situation in this region of Maharashtra State, a major survey was conducted during 1995-96. The survey results revealed that after *Alternaria* blight, downy mildew is the second major disease. Downy mildew incidence was registered in about 36% of sunflower fields (Shirshikar, 1997).

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Recently, around 1997, a new viral sunflower disease named sunflower necrosis disease (SND) was observed in all the major sunflower growing states in India. The disease was first noticed in the vicinity of Bangalore in Karnataka State (Anonymous, 1999a). Within a year the disease spread like wild fire in all sunflower growing states of India, specially Andhra, Karnataka and Maharashtra State and it virtually threatened sunflower cultivation. Chander Rao *et al,* (2000) reported necrosis incidence varying from 30 to 100% in farmers' fields. A similarly survey conducted in Marathwada region, the major sunflower region of Maharashtra state, revealed that the disease incidence ranged from 20 to 80% and all sunflower hybrids / varieties were found to be susceptible to this disease (Anonymous, 1998, 1999).

The necrosis disease is a recent introduction. Preliminary studies have confirmed its association with a strain of tobacco streak virus (TSV) (Bhat *et. al.*, 2002) and acting as its vector.

Presently the sunflower necrosis disease has assumed serious proportions in all major sunflower growing states in India. Resistance sources against this disease are still under investigation and it has been experienced that most of the presently cultivated sunflower hybrids/varieties exhibit susceptibility to the disease. Some prophylactic chemical sprays have been suggested; however, cost of application and full disease control are still limiting factors.

Under such circumstances, it was decided to establish a disease control strategy by adjusting sowing period so that the farmers would get immediate benefit without any cost.

MATERIALS AND METHODS

The experiment was conducted at Oilseeds Research Station (MAU) Latur (M.S.) India, for three consecutive years, from 1999-2000 to 2001-2002.

During the first year (1999-2000), nine sunflower hybrids/varieties viz., MSFH-17, KBSH-1, ZSH-9760, JKSF-51, POC-6360, PAC-1091, Morden, GAU-15 and TNAU-7 were used for sowing.

In the second year (2000-2001), along with the eight hybrids/varieties from the first year, seven new hybrids viz., Mahabeej-917, Sungene-85, KBSH-40, KBSH-42, KBSH-44, KBSH-48, KBSH-50 were used for sowing. Thus a total of 15 hybrids/ varieties were used for sowing in the second year.

In the third year, (2001-2002), 12 sunflower hybrids/varieties viz., KBSH-1, KBSH-41, KBSH-42, KBSH-44, KBSH-50, MSFH-17, POC-63A43, POC-65A24, POC-5914, PAC-1091, Morden and LS-35 were used for sowing.

During the three years of experimentation, all the hybrids/varieties were sown each month from July to February. Thus, eight sowings were undertaken each year. Sowing period was first week of every sowing month. Single replication with a plot

size of 4.20 × 3.0 m was maintained for all the hybrids/varieties during the three years. Distance between rows of 60 cm and distance in the row of 30 cm were maintained and recommended dose of fertilizers was used.

The observations on necrosis disease incidence were recorded for each hybrid/variety at 15-day intervals starting 15 days after sowing. So, four observations were recorded. Based on the number of infected and healthy plants in each hybrid/variety the percent of disease incidence was calculated. The results are presented in Table 1 to 4.

RESULTS AND DISCUSSION

In the year 1999-2000, a total of 9 hybrids/varieties were sown on the monthly basis to assess the influence of different sowing months on the incidence of necrosis incidence. The results revealed that July and August sowings had high mean necrosis incidence of 27.41% and 20.0% respectively (Table 1). Thereafter, there was reduction in necrosis incidence (except for January sowing) indicating that, if sunflower if planted in September and onwards, there is less incidence of the disease.

Table 1: Influence of different sowing months on the incidence of necrosis disease (1999-2000)

No.	Name of hybrid/variety	Mean necrosis incidence (%)								Mean necrosis incidence (%)
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	
1	MSFH-17	33.38	10.19	3.44	0.00	0.00	0.00	24.81	12.05	12.12
2	Morden	17.82	22.31	5.92	4.61	5.04	2.30	11.67	3.80	9.18
3	KBSH-1	7.51	13.04	2.81	0.72	1.70	0.00	16.57	8.80	6.39
4	GAU-15	27.41	20.00	2.81	4.46	8.18	0.00	26.66	10.76	12.53
5	TNAU-7	22.41	25.45	2.98	0.94	3.59	0.00	28.07	12.31	11.97
6	ZSH-9760	27.27	11.62	0.00	2.04	0.00	0.00	21.27	12.76	9.37
7	JKSF-51	25.00	2.22	0.00	3.03	5.88	0.00	10.00	13.04	7.39
8	POC-6360	0.00	5.00	0.00	0.00	6.17	0.00	14.28	8.16	4.21
9	PAC-1091	*	3.17	0.71	4.54	3.98	0.00	27.95	19.19	9.56
10	Mean incidence (%)	20.16	12.61	2.07	2.26	3.83	0.25	20.14	11.20	-

P.S. * indicates poor germination

In the second year of experimentation (2000-2001), a total of 15 hybrids/varieties were sown on the monthly basis starting from July, 2000 to February, 2001. The results are presented in Table 2.

The data presented in Table 2 revealed that during the second year of experimentation (2000-2001) too, the July and August sowings recorded high necrosis incidence of 12.97% and 47.23%, respectively as compared with the rest of the sowing months. The disease incidence was lowered from September onwards. The September sowing recorded 7.19% disease incidence and October sowing 4.73%

disease incidence. The lowest incidence of 0.77% was recorded in November and then there was a slight increase in necrosis incidence in December (2.81%), January (2.14%) and February (4.47%).

Table 2: Effect of different sowing dates on the incidence of necrosis disease (2000-2003)

No.	Name of hybrid/variety	Mean necrosis incidence (%)								Mean necrosis incidence (%)
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	
1	GAU-15	8.95	39.68	5.71	4.68	1.60	3.33	1.63	1.63	8.40
2	TNAU-7	9.37	42.85	4.28	10.60	0.00	3.57	2.85	3.03	9.56
3	MSFH-17	6.25	37.70	20.68	10.00	0.00	1.66	3.70	1.58	10.19
4	KBSH-1	12.69	50.79	0.00	6.34	0.00	1.61	0.00	0.00	8.92
5	PAC-1091	13.81	54.41	11.42	6.25	0.00	4.65	1.72	2.94	11.90
6	Morden	21.73	31.66	3.03	8.82	0.00	0.00	1.66	3.03	8.74
7	Sungene-85	9.23	69.84	6.15	1.53	0.00	0.00	3.44	1.61	11.47
8	Mahabeej-917	20.31	64.70	5.88	0.00	0.00	1.61	1.69	1.66	11.98
9	KBSH-48	14.58	38.81	8.33	1.78	1.81	5.45	2.12	4.00	9.61
10	KBSH-50	28.35	51.56	13.04	5.79	4.28	4.28	1.42	17.84	15.79
11	POC-6360	8.65	47.36	2.94	0.00	0.00	0.00	1.53	3.57	8.00
12	ZSH-9760	6.55	41.07	5.00	0.00	1.69	0.00	0.00	3.44	7.21
13	KBSH-41	10.41	34.61	6.06	1.72	*	*	*	*	13.20
14	KBSH-42	13.43	59.18	8.95	7.57	1.42	1.42	0.00	18.51	13.81
15	KBSH-44	7.24	44.26	6.45	6.66	0.00	11.76	8.33	*	12.10
16	Mean incidence (%)	12.77	47.23	7.19	4.78	0.77	2.81	2.14	4.47	-

P.S. * Indicates poor / no germination of the hybrid/variety

As regards the third year of experimentation (2001-2002), a total of 12 hybrids/ varieties were sown on the monthly basis and the data on necrosis disease incidence were presented in Table 3.

The data presented in Table 3 revealed that the necrosis incidence was evident in all the sowing months. However, the maximum incidence of 75.19% was reported for August sowing followed by July sowing which had 26.28% disease incidence. Thereafter, there was a reduction in necrosis incidence. A similar trend was observed during 1999-2000 and 2000-2001 period.

Based on three-year data, the average necrosis disease incidence was calculated. The results are presented in Table 4.

It is evident from Table 4 that the July and August sowings had necrosis disease in higher proportion i.e., 19.73% and 45.01%, respectively as compared with the rest of the sowing months. As the sowing period progressed i.e., from September onwards, a sharp decline in necrosis incidence was observed. The September sowing had recorded a mean disease incidence of 7.70%. Similarly, October had 5.38% necrosis incidence. The lowest disease incidences of 2.81% and 2.87%,

respectively evident in November and December. However, the January and February sowings had higher disease incidence of 8.68% and 5.49%, respectively.

Table 3: Reaction of sunflower hybrid/varieties against necrosis disease incidence under different sowing date(2001-2002)

No.	Name of hybrid/ variety	Mean necrosis incidence (%)								Mean necrosis incidence (%)
		July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	
1	KBSH-1	8.69	89.83	14.70	11.42	1.92	3.07	5.76	0.00	16.92
2	KBSH-41	30.00	84.78	10.34	15.38	2.70	2.22	2.27	1.42	18.70
3	KBSH-42	22.03	81.25	19.56	15.21	0.00	2.56	1.88	0.00	17.81
4	KBSH-44	27.77	97.36	23.80	16.66	9.43	11.11	12.50	0.00	24.82
5	KBSH-50	29.03	87.03	20.00	9.52	5.00	6.89	7.84	0.00	20.66
6	MSFH-17	17.18	93.33	10.76	2.98	8.33	7.69	3.63	0.00	17.98
7	POC-64A43	10.16	7.14	1.53	0.00	1.58	0.00	0.00	0.00	2.55
8	POC-65A24	37.50	95.08	11.59	7.57	4.54	7.81	3.44	0.00	20.84
9	POC-5914	10.93	19.64	9.52	7.46	1.56	0.00	1.58	3.22	6.73
10	PAC-1091	39.13	86.27	20.37	9.37	6.45	4.47	4.16	1.47	21.46
11	Morden	55.00	87.71	16.36	5.00	1.58	14.28	2.08	3.17	23.14
12	LS-35	27.94	72.88	7.54	8.82	2.98	6.77	0.00	0.00	15.87
13	Mean incidence (%)	26.28	75.19	13.84	9.11	3.83	5.57	3.76	0.81	-

Table 4: Influence of different sowing dates on the incidence of sunflower necrosis disease (1999-2001)

No.	Sowing month	Mean necrosis incidence (%)			Mean necrosis incidence (%)
		1999-2000	2000-2001	2001-2002	
1.	July	20.16	12.77	26.28	19.73
2.	August	12.61	47.23	75.19	45.01
3.	September	2.07	7.19	13.84	7.70
4.	October	2.26	4.78	9.11	5.38
5.	November	3.83	0.77	3.83	2.81
6.	December	0.25	2.81	5.57	2.87
7.	January	20.14	2.14	3.76	8.68
8.	February	11.20	4.47	0.81	5.49
9.	Mean incidence (%)	9.06	10.27	17.29	-

The three-year data presented in Table 4 clearly revealed that the July and August sowings had higher disease incidences compared with the rest of the sowing months. This higher incidence might be attributed to an increased activity of the vector. During July and August, dry spells are normally observed in the region and this might have flared the vector population. Similarly, slight increases in disease incidence were observed in January and February. These months also generally experience dry weather conditions in the region, which may enhance the vector population and thus the disease incidence.

From the three years of experimentation it can be concluded that if sunflower is sown in the post rainy season, i.e., from September onwards, the necrosis disease incidence could be minimized as compared with the normal sowing period i.e. July and August. Thus, by merely adjusting the sowing period, the farmers can combat the disease without involving any extra cost on plant protection. Similarly, the sowing of hybrids such as POC-64A43 can also be helpful to minimize disease incidence as this hybrid had recorded the lowest disease reaction of 2.55% during 2001-2002 season.

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INFLUENCIA DE DIFERENTES FECHAS DE SIEMBRA EN LA APARICIÓN DE LA ENFERMEDAD DE NECROSIS EN GIRASOL

RESUMEN

La nueva enfermedad de necrosis en girasol (SND), que causa un linaje del virus del rayado del tabaco (Tobacco Streak Virus, TSV) en forma de epifitotas, en muchos estados de La India, que se dedican a la producción de girasol desde el año 1996-1997. Esta investigación ha demostrado que la

intensidad de aparición de la enfermedad es entre 30 y 100% en los campos de cultivos.

Como se trata de una enfermedad nueva, se siguen buscando las fuentes de resistencia. Hasta el momento, se ha comprobado que el insecticida imedaclóprido combate la enfermedad.

La influencia de diferentes fechas de siembra en la aparición de la enfermedad de necrosis, ha sido investigada en ORS-u, Latur, en el período 1999-2001. Los datos obtenidos demuestran que la aparición de necrosis era intensiva en el girasol sembrado en el mes de julio y de agosto. El cambio de fecha de siembra puede ayudar en combatir la enfermedad.

INFLUENCE DE DIFFÉRENTES DATES DE SEMAILLES SUR L'INCIDENCE DE LA NÉCROSE DU TOURNESOL

RÉSUMÉ

La nouvelle nécrose du tournesol (SND) provoquée par le stress dû à une race de virus du tabac (Tobacco Streak Virus, TSV) cause des épiphyties du tournesol dans de nombreux États de l'Inde depuis 1996-97. Cette recherche a démontré que l'intensité de l'apparition de la maladie était de 30 à 100% dans les champs des agriculteurs.

Comme la maladie est nouvelle, les sources de résistance font toujours l'objet d'une recherche. Jusqu'à maintenant, on a établi que l'insecticide imedacloprid pouvait combattre la maladie.

Les effets de différentes dates de semailles sur l'incidence de la nécrose ont été étudiés à la Station (ORS), à Latur, pendant les années 1999-200. Les données recueillies ont démontré que le tournesol semé en juillet et en août avait une incidence de nécrose élevée. Le changement de date des semailles pourrait aider à combattre l'apparition de la maladie.