



**P-ISSN: 2349-8528**

**E-ISSN: 2321-4902**

IJCS 2019; 7(2): 2137-2141

© 2019 IJCS

Received: 16-01-2019

Accepted: 20-02-2019

**Sudarshan GK**

Assistant Professor, Department of Plant Pathology, College of Horticulture, Mysuru, University of Horticultural sciences, Bagalkot, Karnataka, India

**Deepa MS**

Senior Assistant Director of Horticulture, Bengaluru, Karnataka, India

**Keerthi Shankar K**

Ph.D Scholar, Department of Floriculture and Landscape Architecture, University of Horticultural sciences, Bagalkot, Karnataka, India

**Mutthu Raju GP**

Assistant Professor, Department of Entomology, College of Horticulture, Mysuru, University of Horticultural sciences, Bagalkot, Karnataka, India

**Yathindra HA**

Assistant Professor, Department of Floriculture and Landscape Architecture, College of Horticulture, Mysuru, University of Horticultural sciences, Bagalkot, Karnataka, India

**Correspondence**

**Sudarshan GK**

Assistant Professor, Department of Plant Pathology, College of Horticulture, Mysuru, University of Horticultural sciences, Bagalkot, Karnataka, India

## Response of gerbera cultivar against *Alternaria* leaf spot, thrips and mortality rate under different growing structure

**Sudarshan GK, Deepa MS, Keerthi Shankar K, Mutthu Raju GP and Yathindra HA**

**Abstract**

An experiment was conducted to screen ten varieties of Gerbera against the thrips, *Alternaria* Leaf spot and mortality rate under different growing structure. The experiment was conducted in College of Horticulture, Mysuru during 2017-2018 and investigation consists of 10 treatments and each treatment was replicated thrice. The cultivar Ambra under shadehouse recorded maximum mortality rate (54.55%), followed by Luxes (35.42%), Bonnie (31.63%) and Rosella (31.92%) under same conditions. Cvs Bonnie and Ariyana under both polyhouse and shadehouse condition, and others Ambra, Cassiana, Devil, Rosella, Sciella grown under polyhouse were showing resistance to *Alternaria* leaf spot. The per cent leaf damage due to thrips was minimum (2.89%) in Cv. Sciella, followed by Carocci (3.41%) grown under polyhouse condition. While it was maximum in cultivars Cassiana (37.22%) and Alberino (33.67%) grown under shade house.

**Keywords:** gerbera, *alternaria* leaf spot, thrips, mortality

**Introduction**

Gerbera commonly known as “Transval daisy” is an important cut flower grown throughout the world, and belongs to the family Asteraceae. Many people are enjoy growing this flower in garden or large container, it demand as cut flower and also as a ornamental potted plant as gaining important in the international market, and as very good export potential due to its graceful appearance, Hardiness, ability to withstand during transportation and long shelf life. Variety with different colour and size made this flower as attractive and used for garden decoration and flower arrangement. This beautiful flower is susceptible to many disease and pest. *Alternaria* leaf spot and thrips are the major destructive fungal diseases and pest. Some environmental conditions are most congenial for *alternaria* leaf spot and thrips includes high relative humidity, moderate high temperature and low light intensity. Unfortunately poly house usually provide all these condition. And variety will react specifically. Therefore information on varieties showing resistance on *alternaria* leaf spot and thrips under different growing structure are meagre. Hence, the present research work was planned to study the, response of gerbera cultivar against *alternaria* leaf spot, thrips and mortality rate under different growing structure.

**Material Method**

The present research was carried out at college of Horticulture, Mysuru during 2017-18. For This experiment, 10 cultivars like Alberibo, Ambra, Ariyana, Bonnie, Carocci, Cassiana, Devil, Luxes, Rosella, Sciella were screened against the *alternaria* leaf spot thrips, and also mortality rate under different growing structures (Polyhouse and shade net). Healthy rooted plants of 30 days old (2 - 4 leaf stage) were planted at the spacing of 30 X 30 cm under polyhouse and shade house condition. The experiment was laid out in Factorial randomized complete block design with 10 treatments and 2 factors (cultivars and growing structure) each treatment was replicated thrice. The recommended package of practices was followed for raising the successful crop. Observation were recorded from 5 plants in each replication and data were statistically analysis as per the procedure given by panse and sukhatme (1984) and tabulated in table 1, 2 and 3.

## Results and Discussion

### Per cent mortality

The data pertaining to the mortality of the plants due to the soil fungal pathogens at two stages of crop growth are present in table 1.

**Table 1:** Mortality rate of the plants (%), and response of Gerbera cultivars to Alternaria Leaf spot Disease as influenced by conditions, cultivars and to their interactions.

Treatment	Number of Thrips per leaf		Per cent of leaf damage.
	30	270	
<b>Conditions</b>			
Polyhouse (s <sub>1</sub> )	2.07	11.64	05.31
Shadehouse (s <sub>2</sub> )	1.07	20.16	16.64
S. Em	0.14	0.17	0.47
CD at 5%	0.40	0.49	1.35
<b>Cultivars</b>			
Alberino (c <sub>1</sub> )	1.61	16.55	17.95
Ambra (c <sub>2</sub> )	2.82	37.28	8.29
Ariyana (c <sub>3</sub> )	1.23	07.70	2.79
Bonnie (c <sub>4</sub> )	0.50	20.82	0.50
Carocci (c <sub>5</sub> )	0.00	2.36	12.28
Cassiana (c <sub>6</sub> )	0.80	16.96	9.81
Devil (c <sub>7</sub> )	3.93	3.43	17.08
Luxes (c <sub>8</sub> )	1.89	29.60	22.46
Rosella (c <sub>9</sub> )	2.0	18.96	7.55
Sciella (c <sub>10</sub> )	0.91	5.35	11.05
S.Em	0.31	0.38	1.06
CD at 5%	0.89	1.10	3.20
<b>Interactions</b>			
S <sub>1</sub> C <sub>1</sub>	3.23	23.39	18.82
S <sub>1</sub> C <sub>2</sub>	2.0	20.0	3.31
S <sub>1</sub> C <sub>3</sub>	2.46	7.94	2.00
S <sub>1</sub> C <sub>4</sub>	1.01	10.0	1.00
S <sub>1</sub> C <sub>5</sub>	0.0	1.68	9.32
S <sub>1</sub> C <sub>6</sub>	1.60	15.82	1.60
S <sub>1</sub> C <sub>7</sub>	3.86	2.85	1.33
S <sub>1</sub> C <sub>8</sub>	1.70	23.77	12.09
S <sub>1</sub> C <sub>9</sub>	4.0	6.0	1.07
S <sub>1</sub> C <sub>10</sub>	0.82	4.92	2.58
S <sub>2</sub> C <sub>1</sub>	0.0	9.71	17.08
S <sub>2</sub> C <sub>2</sub>	3.64	54.55	13.26
S <sub>2</sub> C <sub>3</sub>	0.00	7.45	3.58
S <sub>2</sub> C <sub>4</sub>	0.00	31.63	0.00
S <sub>2</sub> C <sub>5</sub>	0.00	3.03	15.24
S <sub>2</sub> C <sub>6</sub>	0.00	18.10	18.01
S <sub>2</sub> C <sub>7</sub>	4.00	4.0	32.82
S <sub>2</sub> C <sub>8</sub>	2.08	35.42	32.82
S <sub>2</sub> C <sub>9</sub>	0.00	31.92	14.03
S <sub>2</sub> C <sub>10</sub>	1.00	5.77	19.52
S.Em	0.44	0.54	1.49
CD at 5%	1.26	1.56	4.28

### At 30 days after planting

There was a significant difference in the mortality of plants observed due to growing conditions, cultivars and their interactions at 30 days.

The mortality rate of plants was higher from the crop grown under polyhouse conditions (2.07%) than shadehouse conditions (1.07%)

Among the cultivars Cv. Carocci did not show any mortality at 30 days. Cvs. Bonnie (0.5%), Cassiana (0.8%) and Sciella (0.91%) recorded least mortality. Maximum mortality rate was in Cv. Devil (3.93%) followed by Cv. Ambra (2.82%)

The interaction effects of varieties and conditions on mortality were significant. Cv. Rosella under polyhouse and Devil under shade house recorded the highest mortality of 4 per cent.

There was no mortality in cultivars Alberino, Ariyana, Bonnie, Cassiana and Rosella when grown under shadehouse. But, there was no mortality in Cv. Carocci in both the growing situations.

### At 270 days after planting

Mortality rate was significantly high in shade house (20.16%) conditions grown crop when compared with polyhouse conditions (11.64%).

Cultivars varied significantly for mortality at 270 days. Mortality rate was very less in Cv. Carocci (2.36%) and was at par with Cv. Devil (3.43%). Maximum mortality was very high in Cv. Ambra (37.28%) followed by Luxes (29.60%).

The interaction effects of cultivars and conditions significantly increased the mortality where the cultivar Ambra under shadehouse recorded maximum mortality rate (54.55%), followed by Luxes (35.42%), Bonnie (31.63%) and Rosella (31.92%) under same conditions. mortality was minimum in the case of Carocci (1.68%) and was at par with Devil (2.85%) under polyhouse condition. Both these cultivars Carocci and Devil also had less mortality under shade condition also (3.03%, 4.00%, respectively). Cultivar Sciella under both the conditions also performed well with less mortality (4.92% under polyhouse, 5.77% under shade house).

In general the mortality rate was more in shade house compared to polyhouse. This is due to the fact that during rainy season, rain water enter directly into shadehouse creates the excessive moisture in the soil which might have favoured the growig of pathogen.

### Incidence of insect pests and diseases

#### Alternaria leaf spot disease

Alternaria leaf spot incidence in term of per cent disease index was recorded by using 0-5 scale and the data are present in table 2.

The per cent disease index on leaves of gerbera varied significantly due to growing conditions. The leaf spot index was maximum (16.64%) in shade house condition compared to polyhouse (5.31%).

The gerbera cultivars varied significantly for Alternaria leaf spot disease. The Alternaria leaf spot index was maximum in Cv. Luxes (22.46%) which was followed by Alberino (17.95%) and Devil (17.08%) the lowest leaf spot index (0, 50%) was observed in Cv. Bonnie which was on par with Cv. Ariana (2.79%). The Cvs. Cassiana (9.81%), Ambra (8.29%) and Rosella (7.55%) were at par with each other.

Further, the cultivars were grouped in to five categories. among the cultivars two cultivars were resistant (Bonnie and Ariyana), five cultivars were moderately resistant and cultivars were moderately susceptible. There were no cultivars, which were susceptible are highly susceptible (Table 2).

The interaction effect of growing conditions and cultivars on per cent leaf disease index was found to be significant. The Cvs. Luxes and Devil had the highest leaf spot index (32.82%) under shade house condition and lowest or no leaf spot index was recorded in Cv. bonnie under shadehouse. This cultivar also had low leaf spot index (1.00%) under polyhouse condition. This was at on with Cvs. Rosella, Devil, Cassiana, Ariyana, Sciella, grown under poly house and Cv. Ariyana grown under shade house.

The grouping of interaction of growing conditions and cultivars into five categories showed that, cvs Bonnie and Ariyana under both poly house and shade house condition, and others Ambra, Cassiana, Devil, Rosella, Sciella grown

under poly house were showing resistance to alternaria leaf spot. cv. Carocci and Luxes under poly house, Cv. Ambra and Rosella under shade house were moderate resistant, while Cv. Alberino under both conditions, Carocci, Cassiana, Devil. Luxes, sciella under shade house were moderately susceptible.

The higher leaf spot incidence was seen in plant grown shade house than poly house. This may be due to the prevalence of higher relative humidity and temperature in shade house when compare to poly house during the rainy seasons.

**Table 2:** Reaction of Gerbera cultivars against Alternaria Leaf spot disease.

Rating	Reaction	Response of cultivars and their interactions with growing condition.
<b>Cultivars</b>		
0-5 %	Resistant (R)	Bonnie Ariyana
6-15 %	Moderately resistant (MR)	Rosella Ambra Cassiana Sciella Carocci
16-35 %	Moderately susceptible (MS)	Devil Alberino Luxes
36 -55 %	Susceptible(S)	-
56 % and above	Highly susceptible (HS)	-
<b>Interactions</b>		
0-5 %	Resistant (R)	Cv. Bonnie under S <sub>2</sub> Cv. Ariyana under S <sub>2</sub> Cv. Bonnie under S <sub>1</sub> Cv. Ariyana under S <sub>1</sub> Cv. Ambra under S <sub>1</sub> Cv. Cassiana under S <sub>1</sub> Cv. Devil under S <sub>1</sub> Cv. Rosella under S <sub>1</sub> Cv. Sciella under S <sub>1</sub>
6-15 %	Moderately resistant (MR)	Cv. Carocci under S <sub>1</sub> Cv. Luxes under S <sub>1</sub> Cv. Ambra under S <sub>2</sub> Cv. Rosella under S <sub>2</sub>
16-35 %	Moderately susceptible (MS)	Cv. Alberino under S <sub>1</sub> Cv. Luxes under S <sub>2</sub> Cv. Alberino under S <sub>2</sub> Cv. Carocci under S <sub>2</sub> Cv. Alberino under S <sub>2</sub> Cv. Devil under S <sub>2</sub> Cv. Sciella under S <sub>2</sub>
36 -55 %	Susceptible(S)	-
56 % and above	Highly susceptible (HS)	-

### Thrips

The data pertaining to incidence of thrips per leaf and per cent leaf damage at different stages of plant growth are presented in table 3.

#### Number of thrips per leaf 120 days after planting

Data on thrips at 120 days after planting are presented in the table 3 Thrips population on leaves varied significantly due to growing conditions. Between to growing conditions thrips population per leaf was higher under poly house condition (11.21) over shade house (10.09).

Cultivars differed significantly for thrips incidence on there leaves. Thrips population per leaf was minimum in cultivars

Bonnie, Luxes, Devil, Carocci, (2.56, 2.80, 2.83, and 3.20, respectively) also they were on par. Among the cultivars, maximum number of thrips per leaf was observed in cultivar Alberino (29.52), which was followed by Ariyana (22.94) and Cassiana (21.95) which was on par each other.

The interaction of growing condition and cultivars for thrips was incidence was also significant. The cvs. Bonnie (2.07), Luxes (2.28), and Carocci (2.83) had maximum numbers of thrips per leaf under shade house. Similarly and polyhouse also Cv. Luxes had least infestation by thrips (2.10). In both the growing condition maximum number of thrips per leaf (31.55) was recorded in cultivar Alberino grown under polyhouse and (27.50) in shade house. Other cultivars, under polyhouse which recorded more thrips infestation where Ariyana (25.15) and Cassiana (22.06). Same cultivars also had more number of thrips under shade house conditions also.

#### At 240 days after planting

Between two growing conditions, incidence of thrips was significantly higher in polyhouse condition (9.21) over shade house (7.28)

Among the cultivars, Cv. Alberino (21.32) recorded significantly higher number of thrips per leaf. The cultivars Cv. Assiana and Ariyana which had maximum thrips infestation at 120 days after planting continued their susceptibility to thrips incidence at 240 days after planting also, by recording 16.38 and 14.21 thrips per leaf respectively. Number of thrips per leaf was minimum in cultivar Bonnie (1.91). Ather cultivar Carocci, Devil, luxes also showed minimum (1.91, 3.02, 3.33, respectively).

The differences in thrips population due into interaction were significant at 210 days after planting. The thrips population was minimum in case of Bonnie both under shadehouse and polyhouse (1.75&2.07, respectively).the cultivars which had least thrips were Carocci (2.93) under polyhouse and Luxes 92.86) under shade house. Maximum number of thrips per leaf (24.94) was noticed in cultivar alberino followed by Cassiana (18.77) under poly house condition whiling shade house, Cv. Alberino (17.71) recorded the maximum incidence of thrips per leaf.

#### At 360 after planting

Data on thrips at 360 days after planting on presented in the table 3. The thrips population on leaves varied significantly due to growing conditions. Thrips population was higher under shadehouse condition (10.82 per leaf) compared to polyhuose (4.52 per leaf).

Cultivars differed significantly for thrips incidence on their leaves. Cultivar Luxes, devil, Bonnie had minimum thrips population per leaf (2.81, 3.35, 3.49, respectively) and all these were at par. Among the cultivar maximum number of thrips per leaf was observed cultivar alberino (18.91), followed by Cv. Cassiana (14.70) and Ariyana (11.75).

The interaction of growing conditions and cultivar for thrips incidence were significant the cultivar Luxes (1.46) and Devil (1.93) grown under polyhouse condition has maximum number of thrips per leaf and were at par. They were followed by Cv. Rosella (2.67), Ambra (2.66), Bonnie (2.73) & Sciella (2.73) grown under condition maximum number of thrips per leaf found in Cv. Alberino (25.22), followed by Cassiana (21.67) grown under shade house condition. Thrips population was also high in Cv. Alberino grown under polyhouse (12.60).

### Per cent leaf damage per plant per thrips at 120 days after the planting

The per cent leaf damage per plant was significantly high under poly house condition (28.13%). When compared to shade house (22.56%) condition.

There was a significant variation in per cent leaf damages per plant among the cultivars. Maximum per cent leaf damage was recorded in cultivar Alberino (48.53%), followed by Ariyana (42.60%). Cultivars like Cassiana (28.96%), Ambra (26.66%) and Rosella (23.44%), also had higher per cent damage. minimum per cent of leaf damage was seen in Cv. Bonnie (14.56%), Sciella (16.29%), Devil (17.43%), Luxes (17.80%) and Carocci (18.16%).

The interactions of cultivars and conditions on percent leaf damage per plant were significant. Minimum percent damage (11.83%) was seen in Cv. Sciella (11.83%) followed by Bonnie (13.52%) Ambra (14.24%) and Corocci (14.80%) under shadehouse condition and were on par with each other.

Among the cultivars under polyhouse Cv. Alberino had the highest percent of damaged leaves (56.90%) followed by Cv. Ariyana (47.72%). Similarly under shadehouse also the Cv. Alberino recorded maximum per cent of damaged leaves (40.17%) followed by Ariyana (35.47%).

### Percent leaf damage per plant by Thrips at 240 days after planting

The percent leaf damage by thrips varied significantly due to growing conditions at 240 days after planting. Shade house plants recorded lesser leaf damage (12.94%) than those grown under poly house which recorded maximum damage (20.52%)

The cultivars varied significantly for per cent leaf damage per plant caused due to thrips. The percent damage was minimum in Cvs. Scilla (8.95%), Bonnie (9.02%) and Carocci (9.02%).cultivar Albertino recorded maximum damage (37.91%), followed by Ariyana (27.94%).

The interaction of cultivars and conditions were significant with respect to per cent leaf damage by thrips. The per cent damage was minimum in shadehouse grown cultivars Ambra (7.52%), Bonnie (8.37%), Carocci (8.60%) and Sciella (8.75%).

Cultivar Alberino under poly house had higher percent leaf damage per plant (48.28%) then tne other interaction. This was followed by Cv. Ariyana (39.45%) and Cv. Devil (28.58%). Similarly Cv. Alberino had higher number of per cent leaf damage per plant under shade house also.

### Percent leaf damage plant by Thrips at 360 days after planting

The percent leaf damage per plant was significantly high under shade house condition (22.63%) when compared to that of poly house plants (6.50%) at 360 days, The differences in leaf damage by thrips did not differ significantly among the cultivars but minimum percent leaf damage was seen in Cv. Sciella (4.57%) and Bonnie (6.89%), while maximum damage was seen in Cv. Alberino (23.74%).

The interaction of cultivars and conditions on per cent leaf damage for plant were not significant. The per cent leaf damage due to thrips was minimum (2.89%) in Cv. Sciella, followed by Carocci (3.41%) grown under polyhouse condition. While it was maximum in cultivars Cassiana (37.22%) and Alberino (33.67%) grown under shade house.

Thrips incidence was more in polyhouse due to high temperature built up in the structure than the in shade house.

**Table 3:** Response of Gerbera cultivars to Thrips damage in both condition and to their interaction.

Treatment	Number of Thrips per leaf			Per cent of leaf damage.		
	120 DAP	240 DAP	360 DAP	120 DAP	240 DAP	360 DAP
<b>Conditions</b>						
Polyhouse(s <sub>1</sub> )	11.21	9.21	4.52	28.13	20.52	6.50
Shadehouse(s <sub>2</sub> )	10.09	7.28	10.82	22.56	12.94	22.63
S. Em	0.21	0.29	0.12	0.57	0.38	2.65
CD at 5%	0.59	0.84	0.33	1.64	1.09	7.59
<b>Cultivars</b>						
Alberino (c <sub>1</sub> )	29.52	21.32	18.91	48.531	37.91	23.74
Ambra (c <sub>2</sub> )	10.13	5.13	3.95	26.66	11.37	13.24
Ariyana (c <sub>3</sub> )	22.94	14.21	11.75	41.60	27.94	15.88
Bonnie (c <sub>4</sub> )	2.56	1.91	3.49	14.56	9.02	6.89
Carocci (c <sub>5</sub> )	3.20	3.16	5.78	18.16	9.02	8.92
Cassiana (c <sub>6</sub> )	21.95	16.38	14.70	28.98	19.12	22.08
Devil (c <sub>7</sub> )	2.83	3.33	3.45	17.43	19.94	9.01
Luxes (c <sub>8</sub> )	2.80	3.02	2.81	17.80	11.46	8.65
Rosella (c <sub>9</sub> )	6.75	7.78	7.62	23.44	12.56	13.83
Sciella (c <sub>10</sub> )	3.81	6.17	4.25	16.29	8.95	4.57
S.Em	0.46	0.66	0.26	1.28	0.85	5.93
CD at 5%	1.33	1.88	0.74	3.67	2.43	NS
<b>Interactions</b>						
S <sub>1</sub> C <sub>1</sub>	31.55	24.94	12.60	56.96	48.28	13.81
S <sub>1</sub> C <sub>2</sub>	10.84	6.10	2.66	39.08	15.21	10.22
S <sub>1</sub> C <sub>3</sub>	25.15	16.00	7.91	47.72	39.45	7.02
S <sub>1</sub> C <sub>4</sub>	3.06	2.07	2.73	15.60	9.66	4.27
S <sub>1</sub> C <sub>5</sub>	3.57	2.93	2.81	21.52	9.44	3.40
S <sub>1</sub> C <sub>6</sub>	22.06	18.77	7.73	22.88	21.35	6.93
S <sub>1</sub> C <sub>7</sub>	3.37	3.50	1.93	19.28	28.58	4.30
S <sub>1</sub> C <sub>8</sub>	2.10	3.18	1.46	16.37	12.53	4.90
S <sub>1</sub> C <sub>9</sub>	6.96	8.29	2.67	20.20	11.56	7.12
S <sub>1</sub> C <sub>10</sub>	3.39	6.30	2.73	20.74	9.15	2.89
S <sub>2</sub> C <sub>1</sub>	27.50	17.71	25.22	40.17	27.54	33.67
S <sub>2</sub> C <sub>2</sub>	9.41	4.16	5.25	14.24	7.52	16.26
S <sub>2</sub> C <sub>3</sub>	20.73	12.42	15.58	35.47	16.43	24.57
S <sub>2</sub> C <sub>4</sub>	2.07	1.75	4.25	13.52	8.37	9.52
S <sub>2</sub> C <sub>5</sub>	2.83	3.40	8.75	14.80	8.60	14.43
S <sub>2</sub> C <sub>6</sub>	21.83	13.98	21.67	34.08	16.89	37.22
S <sub>2</sub> C <sub>7</sub>	2.28	3.16	4.97	15.58	11.31	13.73
S <sub>2</sub> C <sub>8</sub>	3.49	2.86	4.15	19.23	10.38	12.40
S <sub>2</sub> C <sub>9</sub>	6.53	7.26	12.58	26.67	13.57	20.54
S <sub>2</sub> C <sub>10</sub>	4.23	6.05	5.75	11.83	8.75	6.26
S.Em	0.66	0.93	0.37	1.81	1.20	8.38
CD at 5%	1.88	2.65	1.05	5.19	3.44	NS

### References

1. Deshpande GD, Alseradeker RW, Warke DC. A note on the varietal reaction of hybrid T-Rose to powdery mildew. Research bulletin, Marathwada, Agricultural university. 1979; 3:81-83.
2. Duraigumurugan P, Jagadeesh A. Seasonal incidence and effect of weather parameters on the population dynamics of chilli thrips, *Scirtotrios dorsalis hood* (Thysanoptera: Thripidae) on Rose. Resource management in plant protection during 21<sup>st</sup> century, Hyderabad. 2002; 2:180-183.
3. Gaud MS, Abreu E, Franqui RA. New thrips records (Insecta: Thysanoptera: Thripidae) from Puerto rico. Journal of agriculture of the University of Puerto rico. 1991; 75(3):311-312.
4. Kannan M, Ramdas SS. A variability and heritability studies in Gerbera. Progressive horticulture. 1990; 22(1-4):72-76.

5. Rao VG. Some new host record of *Alternaria* sps. From India, *Mycopath mycol. Appl.* 1963; 19:181-183.
6. Samantha SK, Pal BK, Maiti S. Plant protection measurement of Hybrid Gerbera. National symposium on Recent advance in Indian floriculture, Trichur.12-14, proceedings of Indian society of ornamental Horticulture, 2003, 95P.
7. Singh KP, Mandhar SC. Performance of exotic cultivars of Gerbera under low cost naturally ventilated green house environment. *Indian journal of Agricultural sciences.* 2001; 71(4):244-248.
8. Singh KP, Mandhar SC. Performance of Gerbera cultivars under fan and pad cooled green house environment. *Journal of applied horticulture.* 2002; 4(1):56-59.
9. Seenivasalu GB, Kulkarni BS, Reddy BS, Adiga JD, Thammaiah N. Evaluation of china aster genotype against *Alternaria* leaf spot under field condition. *Journal of ornamental horticulture.* 2004; 7(3-4):345-346.
10. Thammaiah N, Kulkarni BS, Reddy BS, Kulkarni MS. Screening of Chrysanthemum cultivars against *Alternaria* leaf spot under natural condition. *Journal of ornamental horticulture.* 2004; 7(3-4):347-348.