REFERENCES

BANARJEE, S., MUKHERJEE, B., and SEN, C., 1982. Effect of temperature & moisture interaction on the production of dormant propagules of **Macrophomina phaseolina** in amended soil. Indian J. Microbiol. 22:236-237.

DAS, A.C., and WESTERN.J.H., 1959. The effect of inorganic manures, moistures and inoculum on the incidence of root disease caused by **Rhizootonia solani** (Kuhn) in cultivated soil. Ann. Appl. Biol. 47.:37-48.

DHINGRA, O.D., and SINCLAIR, J.B., 1974. Effect of soil moisture and carbon nitrogen ratio on survival of **Macrophomina phaseolina** in soybean stem in soil. Plant. Dis. Reptr. 58:1034-1035.

DINGRA, O.D., and CHANGAS, D., 1981. Effect of soil temperature, moisture and nitrogen on competitive saprophytic ability of **Macrophomina phaseolina**. Tran Brit. Mycol.Soc. 77:15-21.

PAPAVIZAS, G.C. and DAVEY, C.B. 1962. Isolation and pathogenicity of **Rhizoctonia** saprophytically existing in soil. Physiopathology 52: 834-840.

PIPER, C.S. 1950. Soil and plant analysis. Academy Press, New York.

SANFORD, G.B., 1938. Studies on **Rhizoctonia solani** Kuhn. IV. Effect of soil temperature and moisture on virulence. Can J. Research (C). 16:203-213.

SATISHCHANDRA, K.M., HIREMATH, R.V., and HEGDE, R.K. 1979. Effect of organic amendments and fungicides on the saprophytic activity of **Rhizoctonia bataticola** causing root rot of beans. Indian Phytopath. 32:543-546.

SNEH,B., KATAN,J., HENIS,Y., and WAHL.I.1966. Methods for evaluating inoculation density of **Rhizoctonia** in naturally infested soil. Phytopathology 56:74-78.

Madras Agric. J. 80 (8) : 424 - 429 August 1993 https://doi.org/10.29321/MAJ.10.A01676

INFLUENCE OF WEATHER FACTORS ON SORGHUM EARHEAD BUG

R. RAMAMURTHY[1] and M. GOPALAN[2]

ABSTRACT

The sorghum earhead bug Calocoris angustatus Lethierry population at pre-flowering, milky, dough stage and maturity stage of earhead was influenced by three weeks average weather parameters. Morning and evening relative humidity were positively correlated with the population while maximum and minimum temperature and wind velocity were negatively correlated in all the stages of the earhead. The regression equation of three weeks mean

1. Assistant Professor and 2. Dean (P.G.Studies), Tamil Nadu Agricultural University, Coimbatore - 641 003.

was found to have maximum regression co-efficient representing most appropriate equation in all the stages of the earhead. Evening relative humidity showed positive influence while rainfall had negative effect during pre-flowering stage. At milky stage, morning relative humidity and minimum temperature exhibited positive effect while maximum temperature, evening relative humidity, wind velocity and rainfall effected negatively. The positive effect was noticed with maximum temperature, evening relative humidity and rainfall while the negative effect was observed with minimum temperature and morning relative humidity in dough stage. In maturity stage the population was negatively influenced by maximum temperature, wind velocity and rainfall.

Mirid head bugs are one of the most important pests of sorghum in Asia and Africa. Species belonging to the four genera viz., Calocoris, Campylomma, Creontiades and Eurystylus are known to attack sorghum. Among them, Calocoris angustatus Lethierry is the most important one in India. C. angustatus attacks, the panicle from the time of emergence to maturity. The nymphs and adults suck the sap from the developing grains, which remain ill-filled, shrivelled and in cases of severe infestation become completely chaffy resulting in heavy yield loss. The nature of damage head-bugs is more serious because (a) the bugs feed on most valuable part of the plant (b) spoil the grain quality rendering it unfit for consumption, (c) make the grains more prone to disease attack and (d) there is no scope for compensation from adjoining plants (Sharma, 1984). The infestation on C. angustatus was first started in 1914, with Fletcher (1914) recording its occurrence in the plants of South India. The biology of this pest was studied by Ballard (1916) and Cherian et al. (1941). Seasonal occurrence of this pest was studied in Tamil Nadu (Cherian et al., 1941), Andhra Pradesh (Subba Rao and Paul, 1979; ICRISAT 1981) and Karnataka (Hiremath and Thontadarya, 1984). The Objective of this study was to investigate the influence of weather factors on the population of sorghum earhead bug Calocoris angustatus.

MATERIALS AND METHODS

The influence of various weather factors like temperature (maximum, minimum), humidity (0.7.18 hr and 14.18 hr), wind velocity and rainfall in the earhead bug population through its life period of one month was studied by multiple regression analysis. To find out the influence of weather factors which prevailed prior to the observation on the development of C.angustatus, mean of one, two, three and four weeks were considered. All the parameters were considered individually for fitting linear multiple regression for insect population of four different stages of earhead viz., pre-flowering, milky, dough and maturity stages of tested cultivars. R^2 values of four different weeks of particular stages were compared, and multiple regression with highest R^2 value significance was selected as appropriate one and the variables contributing significantly were considered as parameters influencing the bug population.

Table 1. Regression co-efficient of weather factors for earhead bug population - Pre-flowering stage

Week	Regression equation							R^2
1	Y = 130.348	+ 5.0361**	X^1 - 13.307**	X^2 - 1.213*	X^3 + 2.332**	X^4 - 0.243	X^5 - 0.578**	X^6 0.768467**
2	Y = 505.520	- 8.157	X^1 - 5.272	X^2 - 1.465	X^3 - 1.310	X^4 - 0.145	X^5 - 0.671**	X^6 0.800078**
3	Y = 4.648	- 3.236	X^1 - 9.542	X^2 - 0.056	X^3 + 2.551*	X^4 - 0.786	X^5 - 0.899**	X^6 0.840489**
4	Y = 117.664	- 1.878	X^1 - 1.372	X^2 - 1.137	X^3 + 1.687	X^4 - 0.848	X^5 - 0.658**	X^6 0.707254**

Table 2. Regression co-efficient of wather factors for earhead bug population - Milky stage

Week	Regression						R^2
1	Y = 1574.498 - 47.838**	X^1 + 19.035*	X^2 + 1.582	X^3 - 6.788**	X^4 - 2.750	X^5 - 3.949**	X^6 0.86482**
2	Y = 649.419 - 19.998	X^1 + 1.773	X^2 + 2.378	X^3 - 1.281	X^4 - 3.339	X^5 - 2.493**	X^6 0.814803**
3	Y = 3300.494 - 145.374**	X^1 + 126.086**	X^2 + 7.734**	X^3 - 29.143**	X^4 - 9.435**	X^5 - 3.776**	X^6 0.927584**
4	Y = 1700.468 - 99.510**	X^1 + 98.192	X^2 + 6.699	X^3 - 14.965**	X^4 - 9.805**	X^5 - 4.704**	X^6 0.913079**

Table 3. Regression coefficient of weather factors for earhead bug population - Dough stage

Week	Regression equation						R^2
1	Y = 284.860 - 4.117*	X^1 - 3.223**	X^2 + 1.217	X^3 - 0.843	X^4 - 5.811**	X^5 + 0.954	X^6 0.903979**
2	Y = 440.439 + 1.459	X^1 - 18.364*	X^2 - 0.466	X^3 + 1.062	X^4 - 3.984**	X^5 + 1.664	X^6 0.915350**
3	Y = 607.095 + 78.567**	X^1 - 108.951	X^2 - 4.361*	X^3 + 13.611**	X^4 - 0.862	X^5 + 6.826**	X^6 0.959002**
4	Y = 241.469 + 35.120**	X^1 - 59.856**	X^2 - 0.111	X^3 + 8.158**	X^4 + 1.470	X^5 + 1.501**	X^6 0.932811**

Table 4. Regression co-efficient of weather factors for earhead bug population - Maturity stage

Week	Regression equation						R^2
1	Y = 99.283 - 0.222	X^1 + 1.135	X^2 + 0.964**	X^3 + 0.738	X^4 - 1.531**	X^5 - 0.216	X^6 0.934416**
2	Y = 149.059 - 4.795**	X^1 + 1.423	X^2 + 0.808	X^3 + 0.081	X^4 - 1.668*	X^5 - 0.718	X^6 0.934416**
3	Y = 99.089 - 3.865	X^1 + 1.968	X^2 - 0.032	X^3 + 0.504	X^4 - 1.667**	X^5 - 0.989**	X^6 0.939700**
4	Y = 85.032 - 2.131	X^1 + 0.198	X^2 + 0.123	X^3 + 0.703	X^4 - 1.557**	X^5 - 0.270	X^6 0.919396**

RESULTS AND DISCUSSION

Adult bugs present at pre-flowering stage for oviposition and feeding were influenced positively by morning and evening relative humidity and negatively by maximum, minimum temperature and wind velocity. The nymphs and adults found during milky stage showed positive correlation with morning and evening relative humidity and negative correlation with maximum and minimum temperature and wind velocity. In dough stage there was grown up nymphs and adults on the earheads, minimum temperature, minimum temperature and wind velocity had negative correlation, while morning relative humidity, evening relative humidity and rainfall showed positive correlation. During maturity stage population of earhead bugs consisted more of adults and a few late instar nymphs. As observed in the dough stage the correlation was positive between bug population and morning relative humidity, evening relative humidity and rainfall was negative with the rest of the factors.

In general, relative humidity showed a positive correlation while temperature and wind velocity showed negative correlation on the population of C. angustatus. Rainfall also had a negative effect except during dough stage. When considering various weekly weather factor means for fitting multiple regression, three weeks mean prior to the observation was found to be more appropriate for all the observations related to the life cycle of the insect as it completes its life cycle within 16 to 17 days (Ballard, 1916).

All the stages of insects were positively influenced by relative humidity and negatively by temperature. Ballard (1916) reported that moist atmosphere was conducive for the development of C. angustatus. The positive influence of humidity and negative influence of maximum temperature on the earhead bug population were earlier reported by Balasubramanian and Janakiraman (1966) and Hiremath and Thontadarya (1984). Morning relative humidity played a positive role on the earhead bug population (Natarajan, 1985). The population in pre-flowering stage (adult earhead bugs) was effected negatively with rainfall, which is in accordance with the report of Balasubramanian and Balasubramanian (1979). Adults in this stage usually migrate from alternate host to the sorghum panicle or from one panicle to another for oviposition. Rainfall might have adverse effect on the adult activity. In the present study it was found out that the wind had negative influence on development, which is at variance with the findings of Natarajan (1985). The wind might have hindered the migration of adults as observed in the case of rainfall.

REFERENCES

BALASUBRAMANIAN. C. and JANAKIRAMAN. 1966. weather in the incidence of earhead bug (Colocoris angustatus) on Co 12 irrigated (Cholam) at Coimbatore. Indian J. Agron. 11:167-172.

BALASUBRAMANIAN.G., SIVAPRAKASAM.K., KULAN-

DAIVEL and ROBINSON, J.B., 1969. Impact of sorghum hardhead on the incidence of earhed bugs, caterpillar, webber and mound. **Indian J. agric Sci., 13(2)**: 106-108.

BALLARD, B.A., 1916. Claocoris angustatus, Leth. Bullethin No.58, Agricultural Research Institute, Pusa, Supt. Gover. Printing, Calcutta : 8 p.

CHERIAN,M.C., KYLASAM. M.S., and KRISHNAMURTI, P.S., 1941. Further studies on Calocoris augustus. **Madras agric. J., 29**: 66-69.

FLETCHER.T., 1914. Some South indian Insects and other Animals of importance. Supt. Govt. Press, Madras : 565 p.

HIREMATH,I.G. and T.S. THONTADARYA. 1984. Seasonal incidence of the sorghum earhead bug, Calocoris angustatus Lethierry (Hemiptera : Miridae). **Insect Sci. Applic., 5** : 467-474.

ICRISAT. 1981. Annual Report for 1980-81, ICRISAT, Patancheru, Andhra Pradesh, India, pp. 31-32.

NATARAJAN, N., 1985. Biology ad insecticidal control of sorghum earhead bug, Calocoris angustatus Lethierry. Ph.D., Thesis. Tamil Nadu Agricultural University, Coimbatore. 164 p.

SHARMA, M.C. 1984. Screening for host plant resistance to mirid bugs in sorghum. Paper presented at the "International Sorghum Entomology Workshop", 15 to 21 July, 1984. Texas, A & M University, College station, Texas, U.S.A. reprints published by ICRISAT, Patancheru, Andhra Pradesh, India, 26pp.

SUBBA RAO, D.V., and PAUL. M.D., 1979. Effect of winter sowing dates and varieties. **Sorghum Newsl., 22**: 79-80.

Madras Agric. J. 80 (8) : 429 - 433 August 1993

GENETIC VARIABILITY IN SOYBEAN

A.NIRMALA KUMARI[1] and M. BALASUBRAMANIAN [2]

ABSTRACT

The genetic parameters viz., genotypic and phenotypic variances, genotypic co-efficient of variation, heritability and genetic advance were assessed from seventy genotypes of soybean. The varieties showed highly significant differences in mean values for all the characters studied. All the characters showed very high heritability. High genotypic coefficient

1. Asst. Professor, Dept. of Plant Molecular Biology & Biotechnology, CPMB, TNAU, Coimbatore-3.

2. Retired Professor, School of Genetics, TNAU, Coimbatore - 3.