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# Influence of weather parameters on seasonal incidence of thrips and *Groundnut bud necrosis virus* (GBNV) in groundnut (*Arachis hypogea* L.)

**G Vijayalakshmi, N Ganapathy and JS Kennedy**

**Abstract**
Seasonal incidence of thrips and *Groundnut bud necrosis virus* (GBNV) in groundnut (*Arachis hypogaea* L.)" was studied during 2015-2016, at Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu. Groundnut crop was infested by Thrips (*Scirtothrips dorsalis* Hood.) and also act as vector for GBNV. The study revealed that the incidence of thrips and GBNV started in 2nd week of August and population of thrips, reached the peak in the fourth week of September with a mean of 3.40 to 6.4 thrips/3 leaves in (*kharif*) and 3.20 to 7.1 thrips/3 leaves (*rabi*) reached the peak at the end of March. In *kharif* and *rabi* seasons, thrips population showed negative correlation with morning and evening RH and positive correlation with ($T_{max}$) and ($T_{min}$), rainfall and sunshine hours respectively. For GBNV incidence, ($T_{min}$) and evening RH showed negative correlation while ($T_{max}$), morning RH, rainfall and sunshine hours showed positive correlation.

**Keywords:** Seasonal incidence, thrips, GBNV, Groundnut

## 1. Introduction
Groundnut (*Arachis hypogaea* L.) is a valuable cash crop for millions of small scale farmers in the semi – arid tropics and is the principle oilseed crop in India [8]. India ranks second in production with 5 million tonnes from an area of 5 million ha next to China [3]. In India, Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Rajasthan states contribute 90 per cent of total production [2]. It is being grown throughout the year in India. The major insect pests of groundnut are the groundnut aphid (*Aphis craccivora* Koch), leaf miner (*Stomopteryx nertaira* Meyrick), stem borer (*Sphenoptera perotetti* Camron), white grub (*Holotrichia consanguinea* Blanchard), Bihar hairy caterpillar (*Spilosoma oblique* Walker), Tobbaco caterpillar (*Spodoptera litura* Fab.), Red hairy caterpillar (*Amsacta albistriga* Butler), Jassid (*Empoasca kerri* Pruthi), Thrips (*Scirtothrips dorsalis* Hood), Termite (*Odontotermes obesus* Rambur) as reported by Atwal and Dhaliwal [4]. Thrips, besides causing direct damage to the crop by sucking the sap, is also responsible for causing bud necrosis disease and also known to transmit tospoviruses in a persistent and propagative manner [18]. The present investigation was carried out on thrips incidence and bud necrosis incidence in groundnut on the influence of weather factors.

## 2. Materials and Methods
### 2.1 Study period and area
Studies were conducted on groundnut crop to understand the incidence of thrips and GBNV in *kharif* and *rabi* seasons (2015-16) at Tamil Nadu Agricultural University, Coimbatore.

### 2.2 Observations recorded
Observations were recorded at weekly intervals on randomly selected ten plants (variety Co.7) 30 days after sowing to the late stage of the cropping season. Thrips population was recorded by counting top three bud leaves of randomly selected ten plants and the percentage of disease incidence was assessed by recording the number of plants showing disease symptoms of GBNV (chlorotic and necrotic spots, chlorotic and necrotic ring spots on leaves, chlorosis of plant, axillary shoot formation, malformation of bud, drooping of leaf, bud chlorosis, terminal bud necrosis and stunted growth of plant) [16] and the total number of plants examined by using the formula.

GBNV percentage =

$$\frac{\text{Number of GBNV infected plants X 100}}{\text{Total number of plants observed}}$$

### 2.3 Statistical analysis
The data were statistically analysed by correlation analysis was given by Kandakoor *et al*. [8] between weather parameters *viz.,* maximum temperature ($T_{max}$) and minimum temperature ($T_{min}$), morning and evening relative humidity (%), rainfall (mm) and sunshine (hrs), thrips and GBNV incidence.

## 3. Results and Discussion
Based on the observations made at weekly intervals, thrips was found feeding and damaging the groundnut crop during the *kharif* and *rabi* season. Thrips (*Scirtothrips dorsalis* Hood.) was found on the top bud leaves as well as inside the flowers. During *kharif* season thrips became severe during last week of September with the average number varying from 3.40 to 6.40 thrips / top bud leaves. In *rabi* season, thrips population was higher in mid February and March with the average number of 3.20 to 7.10 thrips / top bud leaves (Table 1, Fig 1). They fed on young unopened bud leaves and caused dull yellowish-green patches on upper surface and dark-brown necrotic patches on lower leaf surface as well as curling of leaves.

This commenced from 30 DAS and continued up to 60 DAS and declined later. The highest thrips population was recorded at 30 DAS and continued till 60 DAS while the minimum numbers were observed before 10 DAS and after 90 DAS. The results are in accordance with Wheatley *et al.* [19] and Jayanthi *et al.* [5] who also observed higher thrips population in wetter end of the season compared to drought stress days Singh *et al.* [15] recorded the higher thrips population during vegetative stage.

### 3.1 Correlation between thrips and GBNV incidence with weather parameters
Correlation was observed between the incidence of thrips and rainfall, temperature, relative humidity (RH) and sunshine hours. In *kharif*, thrips population showed negative correlation with morning and evening relative humidity -0.025, -0.223 and positive correlation with maximum and minimum temperature (0.266 and 0.146), rainfall (0.335) and sunshine hours (0.277) respectively. For GBNV incidence, minimum temperature (-0.041) and evening relative humidity (-0.192) showed negatively correlated while maximum temperature (0.390), morning relative humidity (0.017), rainfall (0.518) and sunshine hours (0.343) showed positive correlation (Table 2).

In case of *rabi* season, thrips population and GBNV incidence showed positive correlation with maximum temperature (0.082, 0.185), minimum temperature (0.052, 0.140) and sunshine hours (0.085, 0.193) and negative correlation with morning (-0.322, -0.532) and evening relative humidity (-0.162, -0.077) respectively. Rainfall was not recorded during *rabi* season (Table 3; Fig. 2).

The results are in accordance with Jayanthi *et al.* [6] and Prasad *et al.* [13] for evening relative humidity but rainfall and morning relative humidity contrary to this. The incidence of thrips and GBNV was commenced in the second week of August and touched its peak in the fourth week of September (*kharif*) and end of February and March (*rabi*). In the present investigation it was found that temperature, rainfall and sunshine favours multiplication of the thrips and GBNV, while relative humidity had adverse effect on population build up of thrips and multiplication of GBNV. The findings of present investigation is in close comformity with the finding of Swamy and Patil [17], Kenchaiah and Porte [9], Sharma and Sharma [14], Pareek *et al.* [12], Jyothirmai *et al.* [7], Nandgopal *et al.* [11], Yadav *et al.* [20], Anita and Nandihalli [1], Meena *et al.* [10].

**Table 1:** Incidence of thrips and *Groundnut bud necrosis virus* (GBNV) in groundnut, 2015-16.

| Date of observation | Thrips/ top bud leaves | GBNV incidence |
|---|---|---|
| 31.07.15 | 0.5 | 6.67 |
| 07.08.15 | 0.7 | 13.33 |
| 14.08.15 | 1 | 13.33 |
| 21.08.15 | 1.6 | 20.00 |
| 28.08.15 | 2.6 | 20.00 |
| 04.09.15 | 3.4 | 26.67 |
| 11.09.15 | 3.7 | 33.33 |
| 18.09.15 | 4.9 | 40.00 |
| 25.09.15 | 6.4 | 46.67 |
| 02.10.15 | 4.5 | 60.00 |
| 08.10.15 | 3.5 | 33.33 |
| 16.10.15 | 1.8 | 13.33 |
| 23.10.15 | 0.6 | 13.33 |
| 30.10.15 | 0.2 | 6.67 |
| 31.12.15 | 0.8 | 6.67 |
| 07.01.16 | 1.3 | 6.67 |
| 14.01.16 | 1.6 | 20.00 |
| 21.01.16 | 2.1 | 13.33 |
| 28.01.16 | 2.9 | 26.67 |
| 04.02.16 | 3.2 | 20.00 |
| 11.02.16 | 4.4 | 20.00 |
| 18.02.16 | 5.3 | 46.67 |
| 25.02.16 | 5.6 | 53.33 |
| 02.03.16 | 7.1 | 26.67 |
| 08.03.16 | 3.1 | 33.33 |
| 16.03.16 | 2.2 | 26.67 |
| 23.03.16 | 1.2 | 13.33 |
| 30.03.16 | 0.5 | 6.67 |

**Table 2:** Correlation of thrips and GBNV incidence with weather parameters, during *kharif*, 2015.

| Factors | Temperature (C°) | | RH (%) | | Rainfall (mm) | Sunshine (hrs) |
|---|---|---|---|---|---|---|
| | Max. | Min. | Morning | Evening | | |
| Thrips | 0.266 | 0.146 | -0.025 | -0.223 | 0.335 | 0.277 |
| GBNV incidence | 0.390 | -0.041 | 0.017 | -0.192 | 0.518 | 0.343 |

**Table 3:** Correlation of thrips and GBNV incidence with weather parameters, during *rabi*, 2016.

| Correlation factors | Temperature (C°) | | RH (%) | | Rainfall (mm) | Sunshine (hrs) |
|---|---|---|---|---|---|---|
| | Max. | Min. | Morning | Evening | | |
| Thrips | 0.082 | 0.052 | -0.322 | -0.162 | 0 | 0.085 |
| GBNV incidence | 0.185 | 0.140 | -0.532 | -0.077 | 0 | 0.193 |

**Table 4:** Linear regression equation for incidence of thrips with GBNV and weather parameters, 2015-16.

| Particulars | Regression equation | $R^2$ |
|---|---|---|
| Thrips | $Y = 7.1215 + 0.099X_1 + 2.1723X_2 - 0.0131X_3 - 0.0354X_4 - 0.0263X_4 - 0.0551X_5 - 0.1196X_6$ | 0.7317 |

Y=Incidence of thrips (Number per top bud leaves); X1 = GBNV incidence; X2 = Rainfall (mm); X3 = Maximum temperature (°C); X4 = Minimum temperature (°C); X5 = Morning RH (%); X6 = Evening RH (%); X7 = Sunshine hours (hrs)

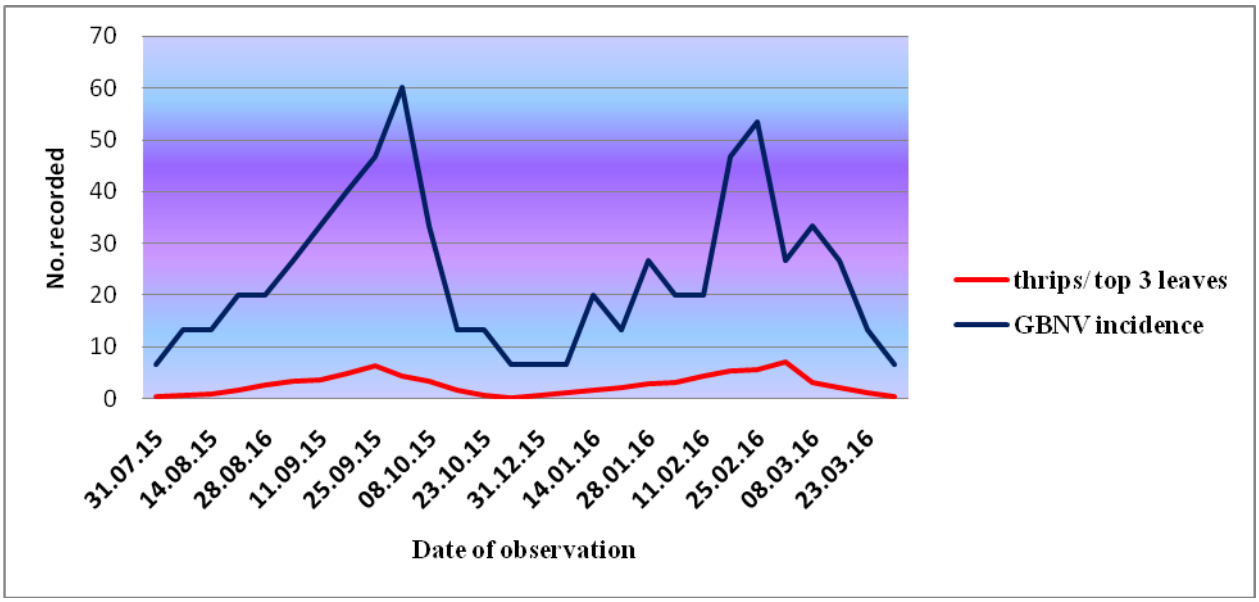


**Fig 1:** Incidence of thrips and *Groundnut bud necrosis virus* (GBNV) in groundnut 2015-16.

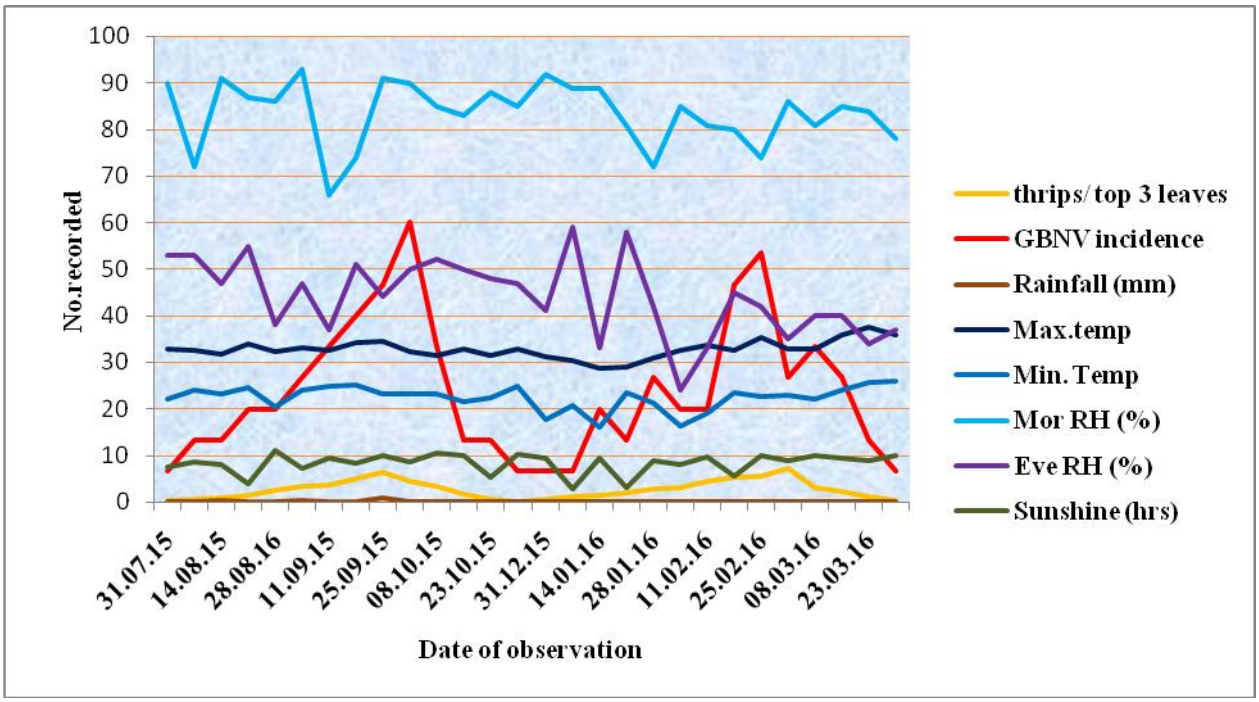


**Fig 2:** Thrips and GBNV incidence in relation to weather parameters.

### 3.2 Multiple linear regression analysis between weather parameters, GBNV and incidence of thrips in groundnut

A multiple linear regression equation was fitted to the data and the equation arrived for the incidence of thrips. Similar work was made by Singh *et al.* [15] was environmental factors which affected the abundance of thrips and leafhopper were identified using multiple linear regressions.

$$Y = 7.1215 + 0.099X_1 + 2.1723X_2 - 0.0131X_3 - 0.0354X_4 - 0.0263X_4 - 0.0551X_5 - 0.1196X_6$$

Where, Y=Incidence of thrips (Number per top bud leaves); X1 = GBNV incidence; X2 = Rainfall (mm); X3 = Maximum temperature (°C); X4 = Minimum temperature (°C); X5 = Morning RH (%); X6 = Evening RH (%); X7 = Sunshine hours (hrs).

According to given regression equation, influence of GBNV and weather parameters to the thrips population was up to 73.17 per cent ($R^2 = 0.7317$), respectively (Table 4).

## 4. Conclusion

The study suggests that peak activity of thrips and GBNV was recorded during August – September (*kharif*) and end of February and March (*rabi*) when plants were 30 days old. Thrips population showed negative correlation with morning and evening RH and positive correlation with ($T_{max}$) and ($T_{min}$), rainfall and sunshine hours respectively and for GBNV incidence, ($T_{min}$) and evening RH showed negative correlation while ($T_{max}$), morning RH, rainfall and sunshine hours showed positive correlation. So, the necessary management practices to take up at early stage of crop for the control of thrips population and GBNV disease because thrips act as vector.

## 5. References

1. Anita KR, Nandihalli BS. Seasonal incidence of sucking insect pests of okra ecosystem. Karnataka Journal of Agricultural Sciences. 2008; 21:137-138.
2. Anon. Annual Progress Report, 2011. National Research Centre of Groundnut, Junagadh (India). 2012; pp. 1-3.

3. Anon. World oilseeds production. World oilseeds market. Miller Magazine, 2013. http://en.millermagazine.com/ world-oilseeds-market/
4. Atwal AS, Dhaliwal GS. Agricultural pests of south Asia and their management. publ. Rajendernagar, Ludhiana. 2008; pp. 274-277.
5. Jayanthi M, Singh KM, Singh RN. Population builds up of insect pests on MH 4 variety of groundnut influenced by abiotic factors. Indian Journal of Entomology. 1993; 55(2):109-123.
6. Jayanthi M, Singh KM, Singh RN. Succession of insect pests on high-yielding variety MH 4 of groundnut under Delhi conditions. Indian Journal of Entomology. 1993; 55(1):24-29.
7. Jyothirmai T, Krishna TM, Ramaiah M, Padmavathamma K, Rao AR. Efficacy of different insecticides against jassids on groundnut. Journal of Entomological Research. 2002; 26:291-295.
8. Kandakoor SB, Khader Khan H, Basana Gowda G, Chakravarthy AK, Ashok Kumar CT, Venkataravana P. The incidence and abundance of sucking insect pests on groundnut. Current Biotica. 2012; 6(3):342-348.
9. Kenchaiah RPM, Porte BS. Some observations on population fluctuation of insect pests of groundnut in Karnataka. Plant Protection Bulletin. 1989; 41:7-10.
10. Meena NK, Kanawat PM, Meena A, Sharma JK. Seasonal incidence of jassid and whitefly on okra in semi–arid region of Rajasthan. Annals of Agriculture Bio Research. 2010; 63:25-29.
11. Nandgopal V. Studied on integrated pest management in groundnut in Saurashtra Ph.D. thesis submitted to Saurastra University, Rajkot, Pesticides. 1992; 8:246.
12. Pareek BL, Kumawat RL, Patni SK. Effect of abiotic factors on the incidence of okra insect pest in semi–arid condition. National Conference on Plant Protection New Horizons in the Millennium, Udaipur. 2001.
13. Prasad TV, Nandagopal V, Gedia MV. Seasonal abundance of sesbania thrips, *Caliothrips indicus* Bagnall in groundnut. Journal of Agrometeorology. 2008; 10:211-214.
14. Sharma GM, Sharma PD. Population dynamics of cotton leaf hopper *Amarasca biguttula biguttula* (Ishida) on cotton and okra. Department of Entomology, CCS Haryana Agricultural University, Hissar. Annals of Biology, Ludhiana. 1997; 13:179-183.
15. Singh TVK, Singh KM, Singh RN. Groundnut pest complex: IV. Regression studies to determine the association between jassid and thrips and weather parameters. *Indian* Journal of Entomology. 1990; 52(4):693-701.
16. Srinivasaraghavan A, Sunkad G, Nalini M, Sudini H. Serodiagnosis of *Peanut bud necrosis virus* of groundnut occurring in North-Eastern Karnataka. Bioinfolet. 2012; 9(2):91-95.
17. Swamy KM, Patil MS. Incidence of groundnut bud necrosis disease in Karnataka. Journal of Farm Sciences. 2016; 29(1):121-122.
18. Ullman DE, Sherwood JL, German TL. Thrips as vectors of plant pathogens. In T. Lewis (ed), Thrips as Crop Pests.CAB International, New York, 1997; pp. 539-565.
19. Wheatley ARD, Wightman JA, Williams JH, Wheatley SJ. The influence of drought stress on the distribution of insects on four groundnut genotypes grown near Hyderabad, India. Bulletin of Entomological Research. 1989; 79(4):567-577.
20. Yadav JB, Singh RS, Tripathi RA. Effect of weather parameters on incidence of pest complex of okra. Annals of Plant Protection Sciences. 2007; 15:477-478.