

BIOLOGY OF *Nysius inconspicuus* DISTANT. AND ITS ECONOMIC IMPACT ON SUNFLOWER (*Helianthus annuus* L.)

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SUMMARY

A breeding population of *Nysius inconspicuus* Distant., a pest of sunflower, was recorded for the first time in Pakistan. Duration of its growth stages, population build up during May and June and economic losses in sunflower were studied at National Agricultural Research Centre, Islamabad, during spring 1992. The development of *N. inconspicuus* Distant. was studied on sunflower florets and heads at an average temperature of 30.65°C under laboratory conditions. Although nymphs did not survive on florets, their survival on sunflower heads was 60% in the first 20 days of development. The insect laid 12 eggs per female in captivity. The average incubation period and the nymphal duration was 5 and 20 days, respectively. The adults lived for 15 days. Thus the total life-span was 40 days. The pest appeared at seed formation stage and reached up to 58 individuals per sunflower head during the season. In a pot experiment 50 or more bugs per head caused about 26% losses in yield and 2% in oil content.

Key words: Duration of life stages, *Helianthus annuus* L., *Nysius inconspicuus* Distant., pest status and economic losses.

INTRODUCTION

Among the non-conventional oilseed crops, sunflower (*Helianthus annuus* L.) is gaining popularity in Pakistan because of its high returns and oil quality. Sunflower contains 40-50% oil content. It is grown during spring and autumn seasons on about 250,000 acres annually with an average production of 1200 kg per hectare. However, its average yield in Pakistan is low compared with that of advanced countries. The reason for low yield can be attributed to many factors. Among them, insect pests attack is by far the most important. According to Lohar (1987) only sucking pests such as whitefly and jassid causes 44% yield losses in Sindh. As sunflower is a new crop, it is vulnerable to new pests. A breeding population of *Nysius inconspicuus* Distant. (Hemiptera; Lygaeidae) was recorded in sunflower, *Helianthus annuus* L. for the first time in Pakistan during spring 1992.

The *Nysius* genus is known to suck cell sap by piercing the epidermis of plants. It belongs to the group of seed bugs. It is a polyphagous pest and recorded worldwide (Dillard *et al.*, 1993; Birtles *et al.*, 1992; Al-Houty, 1990; Kim *et al.*, 1994; Ferguson, 1994). However, scientific information regarding its life cycle, survival, population trend and quantitative and qualitative losses are not available in Pakistan. The present study is to generate preliminary information on the biology of *N. inconspicuus* Distant., its population trend in relationship to crop phenology and quantitative and qualitative losses in sunflower.

MATERIALS AND METHODS

Developmental studies

Mating pairs of *Nysius inconspicuus* Distant. were collected from National Agricultural Research Centre (NARC) sunflower field area. Single pairs were released on individual sunflower heads in plastic jars (approx. 5.5 cm in dia x 7.0 cm length) covered with a muslin cloth. Daily observations were taken for the number of eggs laid which were collected and kept in a 9 cm petri dish with a blotting paper at the bottom. After hatching, single nymph was released separately on sunflower heads having developing seeds and florets in a plastic jar covered with a muslin cloth. The average laboratory temperature during the study was 30.65°C with minimum (28.21°C) and maximum (33.14°C). The feed material (sunflower heads and florets) was replaced daily. The data on the number of eggs laid per female, egg hatching time, nymphal and adult durations and their survival on sunflower heads and florets were recorded.

Population studies

Sunflower hybrid Hysun-33 was planted on 20th February, 1992 on one-acre field at National Agricultural Research Centre (NARC), Islamabad, during spring 1992. Populations of *N. inconspicuus* Distant. were recorded fortnightly. Each time 40 plants were selected randomly. To collect insect, sunflower heads were shaken vigorously after wrapping them in muslin cloth bags. When all bugs fell into the bags, they were removed from sunflower heads, their opening ends were knotted properly and were put in a freezer at 0-5°C for 24 hours before counting the nymphs and adults.

Loss studies

The sunflower hybrid Hysun-33 was planted in pots on 20th February at NARC. The experiment was a randomized complete block design with two treatments and four replications of each. The treatments were (i) sunflower heads without bug population *i.e.*, check (T1) and (ii) heads with field population of *N. inconspicuus* Distant. having no pest control measures (T2). The untreated plot was regularly monitored for bug population. When their population initiated, ten sunflower heads at complete seed formation stage from each replication were bagged for the elimination of the bug.

Bagged plants were daily inspected for the bug exclusion up to 20 days. From the first treatment, ten randomly selected plants from each replication were observed weekly for bug population. Data for yield loss, oil content and fatty acid composition were recorded at crop maturity for further analysis by MSTAT-C.

RESULTS AND DISCUSSION

Developmental studies

Duration of developmental stages. The average eggs laid per female were 11.62 in captivity. The average incubation period was about 5 days and nymphal duration in different instars was about 20 days. The adults survived for 14-15 days whereas the total life duration was 40 days (Table 1). These results are in agreement with Kim *et al.*, (1994) who studied the biology of *Nysius plebejus* Distant. on chrysanthemum. They observed that it took about 10.23 days for incubation, 36.17 days for nymphal duration and 46.40 days for total period. But Gellatley and Forrester (1985) reported that a single female of *N. vinitor* lays up to 400 egg which incubate in 7 days and it takes about 28 days from the egg to adult stage. These variations in the biological parameters with the later authors might be due to the differences in species and climatic conditions.

Table 1: Duration of each life cycle stage of *Nysius inconspicuus* Distant. on sunflower heads

Growth stage	Duration (days) \pm SD*
Egg duration	4.654 \pm 0.962
Nymphal duration	20.338 \pm 0.293
Adult duration	13.731 \pm 0.856
Total duration	38.720 \pm 0.704
No. of eggs/female	11.622 \pm 1.933

* Standard deviation

Survival. The data showed that after two days, nymphal survival was 100% on sunflower head and 24% on the florets (Table 2). After 10 days, the survival remained 80% on head seeds and 5% on florets, whereas 60% population survived for 20 days (nymphal duration) on sunflower head having seeds the bug population did not survive on sunflower florets. This showed that *N. inconspicuus* Distant. only survived on the heads of the sunflower.

Population studies

The results showed that *Nysius inconspicuus* Distant. appeared after flower initiation. Earlier, Franzmann *et al.*, (1992) also reported that *N. vinitor* and *N. cleve-landensis* were found during budding and flowering stages of the spring planted sunflowers in Australia. During this study, the population took off in the first week of June at late seed development stage and remained until harvesting of the crop. The average number of bugs was two per head in the first week of June. However, a

Table 2: Survival of *Nysius inconspicuus* Distant. on sunflower florets and heads

Days	Survival (%)	
	Florets	Heads
02	25.53	100.00
10	05.88	80.28
20	00.00	60.00

sharp increase was observed in population in the last week of June reaching 58 bugs per head before harvesting of the crop this year (Figure 1). Broadley *et al.* (1986) reported that *Nysius* spp. population can increase up to 221 bugs per head in Australia. As this is the first appearance of *N. inconspicuus* Distant. in our fields, its population may also increase in the coming years.

Loss studies

The pot experiment results showed that there was 26% seed yield reduction and about 2% losses in oil contents due to *N. inconspicuus* Distant. damage. Fatty acid composition was also different in both treatments (Table 3). Broadley (1978) reported that seed yield and oil quality of sunflower are affected by *N. vinitor* Bergr. and *N. clevelandensis* Evans. in Australia. Broadley *et al.* (1986) also recorded 2% oil content loss in unsprayed blocks of sunflower as compared with sprayed.

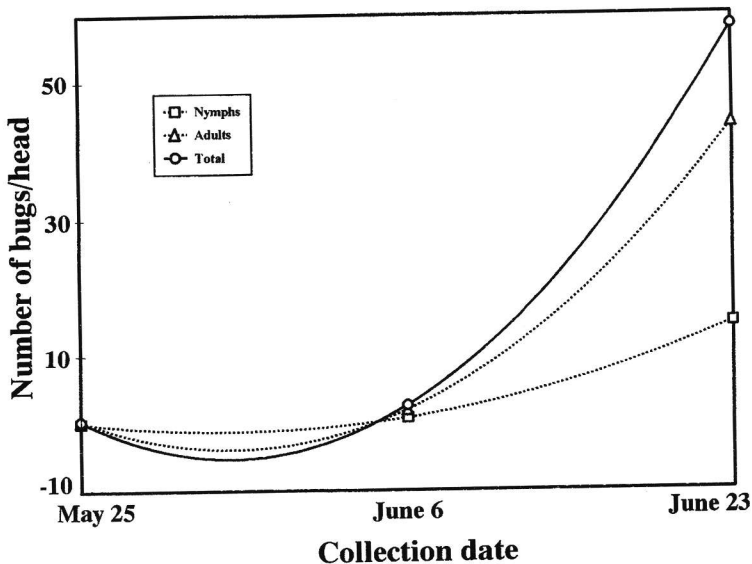


Figure 1. Population trend of *Nysius inconspicuus* Distant. on spring sunflower crop during 1992

Broadley (1978) also stated that *N. clevelandensis* damages the sunflower by reducing the grain yield, oil content and seed germination.

Table 3: Quantitative and qualitative losses by *Nysius inconspicuus* Distant. in sunflower

Treatment	Yield/plant (g)	Oil content (%)	Fatty acids (%)		
			Palmitic	Oleic	Linoleic
Sunflower heads without bugs (check)	100.0	42.4	5.0	45.2	48.8
Sunflower heads with bugs	74.2	40.8	5.3	41.9	50.7

CONCLUSION

It may be concluded that *Nysius inconspicuus* Distant. attacks sunflower only during spring season in Pakistan, feeding on its seeds. It may be categorized as a serious direct pest of the sunflower crop. It might become a danger for sunflower seed production in near future.

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REFERENCES

- Birtles, D.B., Waddell, B.C. and Maindonald, J.H., 1992. Mortality response of *Nysius huttonii* to a dry head disinfection treatment for apples. Proceedings of 45th New Zealand Plant Protection Conference. pp: 269-273.
- Broadley, R.H., 1978. Insect pest of sunflower. Advisory leaflet No. 1433. Division of plant industry, Department of primary industries. pp: 3-10.
- Dillard, H.R., Weiks, T.J. and Philip, B., 1993. A grower survey of diseases, invertebrate pests and pesticides use on potatoes grown in South Australia. Australian Journal of Experimental Agriculture. Vol. 33 pp: 653-661.
- Ferguson, C.M., 1994. *Nysius huttonii* (Heteroptera: Lygaeidae) a pest of direct drilled brassica. Proceeding of 47th New Zealand Plant Protection Conference. pp: 196-197.
- Frazmann, B.A., Lloyd, R.J. and Scholz, B.C.G., 1992. The rutherghlen bug and grey cluster bug in Queensland. Their relation to sunflower. Proceedings of 9th Sunflower Association Conference Xepooa Old. pp: 94-97.
- Gellatley, J.G. and Forrester, N.W., 1985. Rutherghlen bug. Agfact. AE 41 First Edition. Department of Agriculture, New South Wales, Australia.
- Kim Jeony-Bu, D.S. Kang, T.S. Kim, W.K. Shin, and Lee Yu-Sik, 1994. Studies of *Nysius plebejus* Distant. (Hemiptera: Lygaeidae) an insect pest of chrysanthemum. Korean Journal of Applied Entomology. 33(2):56-59.
- Kim Jeony-Bu, D.S. Kang, T.S. Kim, W.K. Shin, and Lee Yu-Sik, 1994. Investigation of Pentatomid species of chrysanthemum of host plant on *Nysius plebejus* Distant. (Hemiptera: Lygaeidae) and its control. Korean Journal of Applied Entomology. 33(1):1-5.
- Lohar, M.K., 1987. Field evaluation of insecticides against jassid (*Amrasca devastans* D.) and whitefly (*Bemisia tabaci* G.) on sunflower crop. Sarhad J. Agric. Res. 3(2):215-220.

**BIOLOGIA DE *Nysius inconspicuus* Distant Y SUS
PÉRDIDAS ECONÓMICAS EN GIRASOL
(*Helianthus annuus* L.)**

RESUMEN

Una población de *Nysius inconspicuus* Distant, una plaga de girasol, fué identificada por primavera en Pakistán. La duración de sus estados de crecimiento, formación de la población durante Mayo y Junio, y las pérdidas económicas en girasol fueron estudiadas en el Centro Nacional de Agricultura, Islamabad durante la primavera de 1992. El desarrollo de *N. inconspicuus* Distant fué estudiado en las flores y capítulos de girasol a una temperatura media de 30.65° C bajo condiciones de laboratorio. Aunque las ninfas no sobrevivieron sobre las flores, su supervivencia sobre capítulos de girasol fué 60% en los 20 días de desarrollo. El insecto puso 12 huevos por hembra en cautividad. El periodo de incubación medio y la duración ninfal fué de 4 y 20 días, respectivamente. Los adultos vivieron durante 15 días. Por tanto el periodo total de vida fué 40 días. La plaga apareció en la fase de formación de semilla y alcanzó hasta 50 individuos por capítulo durante la estación. En un experimento en macetas 50 o más insectos por planta causaron alrededor de 26% de pérdidas en rendimiento y 2% en contenido de aceite.

**BIOLOGIE DE NYSIUS INCONSPICUUS DISTANT., ET
PERTES ÉCONOMIQUES OCCASIONNÉES AU TOURNESOL
(*Helianthus annuus* L.)**

RÉSUMÉ

Une population de *Nysius inconspicuus* Distant., ravageur du tournesol, est mentionnée pour la première fois au Pakistan. La durée des stades de croissance d'une population se développant en mai et juin et les pertes économiques occasionnées au tournesol ont été étudiées au centre National Agricole d'Islamabad, durant le printemps 1992. Le développement de *N. inconspicuus* Distant., a été étudié sur des fleurons et capitules de tournesol à une température moyenne de 30.65°C dans les conditions du laboratoire. Bien que les nymphes ne survivent pas sur les fleurons, leur survie sur les capitules de tournesol était de 60% durant les premiers 20 jours de développement. L'insecte femelle pond 12 oeufs en captivité. Les durées moyennes d'incubation et du stade nymphe vent respectivement de 5 et 20 jours. La durée de vie d'un adulte est de 15 jours. Ainsi, la durée totale de vie de l'insecte est de 40 jours. La maladie apparait au stade formation de la graine et on peut denombrier jusqu'à 58 individus par capitule de tournesol durant la saison de culture. Dans une expérimentation en pots, 50 insectes ou plus par capitule entraînent des pertes de rendement de 26% et de 2% de teneur en huile.