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## EFFECT OF THE PARASITE PLANT *Lennoa madresporoides* Lex. ON SUNFLOWER CROP IN THE STATE OF GUANAJUATO, MEXICO

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**Abstract:** In the state of Guanajuato in Mexico, from 2016 to 2024, the planting of high oleic sunflower has been promoted, mainly under rainfed and irrigated conditions. During the spring-summer cycle of 2024, it was reported in four commercial lots of high oleic sunflower, which were in the flowering stage to grain filling, but with drying of the entire distributed in patches of up to almost a quarter of a hectare in the producer's plot. The location of these plots was in the municipalities of Pueblo Nuevo and Dolores Hidalgo, both located in the state of Guanajuato, Mexico. The objective of the research was: 1) to identify the cause of plant drying at the flowering stage and during grain filling; 2) to determine the incidence and degree of severity on sunflower yield in the affected plots in both municipalities. Results in both municipalities, the most affected lot was sampled to detect and identify the cause of the drying of the plant, it was corroborated that the plant attached to the sunflower root is the parasitic plant known as "ground flower" *Lennea madrepoides* belonging to the *Lennoaceae* family. Regarding incidence, the average percentage was 74.8% and 80.8% in the municipalities of Pueblo Nuevo and Dolores Hidalgo, and the percentage of severity in yield reduction was 90% and 91%, respectively, in both municipalities.

**Keywords:** root parasite, angiolote, San Andres flower, tlachiolote.

## INTRODUCTION

Sunflower (*Helianthus annuus* L.) is an oleaginous plant that plays a fundamental role in human nutrition in the cooking of food (Lentz, *et. al.* 2001). It is one of the main sources of edible oil extraction (López, 2003), containing up to 40% of oil in its kernel, of excellent flavor and quality. In addition to the above, this crop is tolerant to frost and drought (Lentz *et. al.*, 2008), which makes it an excellent production alternative in the state of Guanajuato in Mexico (Robles, 1980). In this entity during the period 2018 to 2020, 1,320 hectares were planted, in the spring-summer cycle (P-V), of which 70% were under irrigated conditions and 30% under rainfed conditions, with a yield of 3.0 and 2.4 t ha<sup>-1</sup> in irrigated and rainfed respectively (SIAP, 2020).

The Federal Government, since 2008 to date (SAGARPA, 2005), is supporting the planting of oilseeds through a program called Pro-Oleaginous, in which producers interested in planting this crop, once enrolled in this program, are considered to receive a stimulus, which consists in that when harvesting, for each ton marketed after proof of sale, they receive \$ 1,500.00, in order for the producer to continue planting oilseeds, since Mexico is not self-sufficient in the production of oilseed grains.

The planting of high oleic sunflower hybrids is currently being promoted by the companies Nuseed, Pioneer and Syngenta, and contract farming is being offered by different companies such as PepsiCo, AK de Jalisco and Tron Hermanos de Morelia, with the Guanajuato Government's Secretary of Agricultural and Rural Development (SDAyR) endorsing the contract between the producer and the company.

In Mexico, there are reports of root-parasitic herbaceous plants, flowering from July to November, widely distributed in Mexico (Calderon, 1996), Guatemala, Colombia and Venezuela, lacking chlorophyll, often provi-

ded with glandular hairs; leaves reduced to small scales; inflorescence usually very dense, cymose-paniculate, spiciform or head-like; flowers small, hermaphrodite, actinomorphic or slightly zygomorphic; sepals 5 to 10, free or almost free; corolla symmetrical, tubular, with 5 to 8 imbricate lobes; stamens 5 to 10, arranged in one or two series, filaments short, attached to the corolla tube, anthers bilocular; ovary succumbent, 6 to 14 carpels joined together, but at the same time divided by a false septum (so that in cross section of ovary twice as many locules as carpels are observed), ovule 1 in each locule, anatropic, almost horizontal, style single, stigma capitate or truncate, sometimes crenulate; capsular fleshy fruit, late and irregularly circumscribed, containing 12 to 28 monospermous pyrenes; seed with globose embryo embedded in the abundant endosperm, identified as *Lennea madreporoides*. Some references in Mexico indicate that the parasitic plant is consumed stewed like cauliflower. There are also records that, at least in other times, it was used as a medicinal. In the Mexican Altiplanic, in turn, it is found sporadically and preferably living on roots of representatives of the *Compositae* family, which thrive as weeds in the fields (Villaseñor and Espinoza, 1998).

In the spring-summer cycle of 2024, two lots of high oleic sunflower were reported, with drying of up to a quarter of a hectare in plots in the municipality of Pueblo Nuevo, Guanajuato, whose average area of each plot per producer is four hectares; and two plots of high oleic sunflower were also reported with patches of plant drying in the municipality of Dolores Hidalgo, Guanajuato, in an area of about a quarter of a hectare, for which the objective was 1) to identify the causal agent of plant drying; and 2) to determine the percentage of incidence and the percentage of severity of yield reduction, compared to healthy plants, in both locations reported.

## MATERIALS AND METHODS

**Report.** In the spring-summer cycle, during the month of October 2024, there was a report of plots planted with sunflower, with patches that showed drying of the plant in the flowering stage and during grain filling, almost completely withered in the municipality of Pueblo Nuevo and also in the municipality of Dolores Hidalgo, both municipalities located in the state of Guanajuato, The technicians of the Secretary of Agricultural Development of these municipalities (SDAyR, 2024) scheduled a technical visit to investigate and sample what caused the drying of the plant, as well as to evaluate the percentage of incidence and the degree of severity of the decrease in grain yield.

**Sampling in the localities.** Of the affected plots in the municipality of Pueblo Nuevo and Dolores Hidalgo, the most affected plot was selected (each plot with an area of 4 hectares), it was found that there were indeed patches of drying of plants up to almost a quarter of a hectare, caused during the flowering stage to grain filling, preventing the grain from filling. When the plot was sampled, ten complete plants with roots were removed, noting that, at the base of the stem neck of the plant, at ground level, there were small purplish flowers and when they were discovered, the parasite plant was detected, attached to the main root of the sunflower, which caused the drying, which was compared with healthy plants, which did not present the detected problem. A sample of the parasitic plant was obtained and photographed for identification.

Then, five points were randomly sampled, marking them, each 10 m long along the furrow (furrow width at 76 cm) counting 50 plants in that length and counting how many of them had the parasite plant in the neck of the stem, to determine the percentage of incidence. At harvest maturity of these lots, 5 points were sampled and at each point 50

Sampling points	Number of plants sampled	Number of parasitized plants	Percentage of incidence %	Yield of parasitized plants	Yield of healthy plants kg/ha
1	50	38	76	210	2150
2	50	40	80	194	2050
3	50	35	70	229	1984
4	50	42	84	168	1958
5	50	32	64	234	2210
Average	50	37.4	74.8	207 B kg/ha	2070.4 A **

Table 1. Incidence of the parasitized plant in the most affected lot of the Syngenta hybrid in the municipality of Pueblo Nuevo, Guanajuato.

\*\* = highly significant; \* = Similar letters are statistically equal treatments, otherwise they are different (Student 5%).

Sampling points	Number of plants sampled	Number of parasitized plants	Percentage of incidence %	Yield of parasitized plants	Yield of healthy plants kg/ha
1	50	45	90	112	2155
2	50	42	84	163	2050
3	50	38	76	215	2248
4	50	42	84	188	2154
5	50	35	70	219	2100
Average	50	40.4	80.8	179.4 B	2141.4 A **

Incidence of the parasitized plant in the most affected lot of the Syngenta hybrid in the municipality of Dolores Hidalgo, Guanajuato.

\*\* = highly significant; \* = Similar letters are statistically equal treatments, otherwise they are different (Student 5%).

heads were harvested (in 10 m), which were threshed, moisture content was measured, grain yield was weighed and converted to yield per hectare.

**Agronomic management.** In the lots reported, Syngenta 9530 was planted in the spring-summer cycle, at the bottom of the furrow in “flooded” soil once the precipitation wet the soil to a depth of 10 cm. The fertilization formula applied was 80-40-00 all at sowing, for weed control Premerlin 600 CE was applied in pre-emergence at a dose of 2 L ha<sup>-1</sup> and for leafhopper control Cypermethrin was applied at a dose of 1.0 L ha<sup>-1</sup>.

**The variables taken were:** 1) Percentage of incidence equal to number of diseased plants between number of total plants in 10 m length; 2) Percentage of severity equal to yield in the sampled furrow diseased between the yield of the healthy furrow delimited in 10 m length.

## RESULTS AND DISCUSSION

**Identification of the parasitic plant.** For the identification of the parasitic plant, reports were consulted and through direct consultation with the Comité Estatal de Sanidad Vegetal de Guanajuato (CESAVEG) and the University of Chapingo, with live and photographic material, it was identified as *Lennea madreporoides* Lex..., known as “flor de tierra”, which coincides with the report made by Calderón de Rzedowski in 1996, who describes it as a herbaceous plant, fleshy, lacking chlorophyll, parasite of roots, subway stem, simple or branched, provided with caulinar scales instead of leaves, inflorescences in the form of dense cymes, bracteate; sepals(5)8, linear, practically free; persistent corolla elongate or short, infundibuliform, with folded blade, lobes (6)8 often marginate; stamens inclusive, of the same number as corolla lobes, arranged in two series; ovary usually of 8 carpels and

16 locules; fruits with about 20 to 28 pyrenes, which is preferably living on roots of representatives of the *Compositae* family (*Araceae*) that thrive as weeds in cultivated fields, distinguishing two forms, which differ from each other in the length of the corolla; one is of longer flowers (which is the one reported) which is the *madreporoid* form and the one of smaller flowers which is the *caerulean* form.

**Percentage of incidence and severity in Pueblo Nuevo, Guanajuato.** Table 1 shows the results of the plots reported with dryings in that municipality, with the number of plants sampled in 10 m longitudinal from each sampling point in total five points, as well as the count of the number of parasitized plants, as well as the grain yield of the parasitized plants and the grain yield of the healthy plants. The incidence percentage was 74.8 % incidence, ranging from 64 to 84 %. The percentage of severity in yield reduction caused by the parasitized plant was 90 %, since the yield per hectare of the parasitized plants was 207 kg and that of the healthy plants was 2070.4 kg ha<sup>-1</sup>.



Parasitized plant (*Lennoa madreporoides*) on the root and base of the stem collar of the sunflower plant.

**Percentage of incidence and severity in Dolores Hidalgo, Guanajuato.** Table 2 shows the results of the lot selected for having the largest area of drying in that municipality, with the number of plants sampled in 10 m (50 plants) longitudinally from each sampling point, as well as the count of the number of parasitized plants, the grain yield of the parasitized plants and the grain yield of the healthy plants. The incidence percentage was 80.8 %, with a range of 70 to 90 %. The percentage of severity in yield reduction caused by the parasitized plant was 91 % on average, since the yield per hectare of the parasitized plants was 179.4 kg and that of the healthy plants was 2141.4 kg ha<sup>-1</sup>.

It is noticeable that both parasitized and healthy plants had the same plant height and there were no differences, which would indicate that during vegetative development there were no drying problems, these plants grew normally and it was until the stage of flowering to grain filling when the drying spots were detected.

## CONCLUSIONS

The identification of the parasitic pectate corresponded to *Lennoa madreporoides* Lex, known as “flor de tierra”.

The average incidence percentage was 74.8% in the municipality of Pueblo Nuevo, with a decrease in yield of 90%; and in the municipality of Dolores Hidalgo the incidence was 80.8% and the effect on the decrease in grain yield was 91%.



## REFERENCES

- Calderón, de R. G. 1996. Lennoaceae. *In*: Flora del Bajío y de regiones adyacentes. Fascículo 50. Pp. 1-6.
- CONASIPRO, 2012. Comité Nacional Sistema Producto Oleaginosas. Oleaginosas en cadena. Girasol, situación actual mundial y nacional Boletín bimestral No. 6.
- Lentz, D.L., Pohl, M.E.D., Pope, K.O. & Wyatt, A.R. 2001. Preshistoric sinflower (*Helianthus annuus* L.) domestication in México. *Economic Botany* 55:370-376.
- Lentz, D.L., Pohl, M.E.D., Alvarado, J.L., Tarighat, S. & Bye, R. 2008. Sunflower (*Helianthus annuus* L.) as a pre-Columbian domesticate in México. *Proceeding of the National Academy of Science* 105:6232-6237.
- López, B. L. 2003. CULTIVOS INDUSTRIALES. Ediciones Mundi-Prensa. Pp: 1071.
- Hernández, M., M. 2011. Cultivos Alternativos para Guanajuato. Instituto Nacional de Investigaciones Agrícolas y Pecuarias. CIRCE. Campo Experimental Bajío. Celaya, Guanajuato. Libro Técnico No. 4.
- Robles, S. R. 1980. Producción de Oleaginosas y Textiles. Editorial LIMUSA, S.A. México, D.F. Pp: 675.
- SAGARPA – INIFAP. 2005. Programa Nacional de Oleaginosas. pp. 10-22.
- SDAyR 2024. Informe anual de los cultivos alternativos establecidos en el estado de Guanajuato. Gobierno del Estado de Guanajuato. 42p.
- Servicio de Información y Estadística Agroalimentaria y Pesquera (SIAP). 2020. Avance de siembras y cosechas año agrícola 2007 y 2020 en México. En línea disponible en <http://sagarpa.gob.mx>.