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Conserving Honey Bees with Forage Plant Mexican Creeper - *Antigonon leptopus*

Society for Promotion of Horticulture
ICAR - Indian Institute of Horticultural Research, Bengaluru - 560 089

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# JOURNAL OF HORTICULTURAL SCIENCES

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## *Short Communications*

## *In this issue…*

***Hearty New Year Greetings from our Editorial Team to all the readers of JHS!***

*As the world is slowly coming out of glitches of pandemic, there is no other better way than celebrating 2021 as Year of Fruits and Vegetables as announced by United Nations Assembly to welcome the new year and recognize the importance of nutrition for better health. Fruits and Vegetables ensure the Nutritional Security to humankind. They play key role in addressing the malnutrition that is a major concern. We are proud that JHS creatins awareness of importance of fruits and vegetables by publishing the recent developments in research with respect to these crops.*

*Diversity of fruit crops and genetic resources available with respect to fruit crops are important for developing better fruit crop varieties.* ***Sankaran and Dinesh*** *have reviewed the "Biodiveristy of Fruit Crops in India" in a very comprehensive way. There is diversity in Jasmine species.* ***Ganga et al.*** *carried out the palynological investigations and recorded the variability in pollen morphology in different species of Jasmine by documentating images using scanning electron microscope. Biodiversity can be linked to livelihood also. One such success story with tamarind selection 'Lakhamna' is being reported by* ***Kanupriya et al.*** *This tamarind selection has been identified from participatory breeding programme. It has a better pod characters and more preferred by consumers.*

*Protected cultivation has seen greater momentum in last two decades.* ***Adeniji et al.*** *identified the best varieties of tomato for polyhouse cultivation in Nigeria.* ***Rao et al.*** *selected two gladiolus hybrid selections IIHRG-7 and IIHRG-11 with red purple and red coloured flowers respectively. These hybrids have resistance to Fusarium wilt and suitable for cut flower and flower arrangement purposes.* ***Sankaran et al.*** *analysed the variance for 6 quantitative and 30 qualitative traits in mango in 400 genotypes and identified 18 clusters. Selected genotypes from specific clusters can be used in hybridization programme.*

*The production aspects are important in perennial crops. It is crop management that needs to be prioritized for enhanced yield.* ***Adiga et al.*** *have reviewed the research work carried in "Canopy Management in Cashew", providing the wholistic view of cultural operations to have a better crop. Use of soilless medium in nursery industry is gaining importance. Best suited potting mixture for mango stone graft of cv. Alphonso has been identified by* ***Lad et al.*** *They found that cocopeat + leaf manure + compost (1:1:2) as pot mixture provided better plant growth.*

*Growing Chrysanthemum in pots is practiced in home and terrace gardens. The cultivar Kikiobiory is well suited for this purpose.* ***Thakur*** *has studied the nitrogen requirement for this cultivar and has come out with the recommendation of 300 mg of N per pot applied* *twice in September and October in Punjab for best results. In another study,* ***Singh and Bala*** *confirmed that use of benzyl adenine at 200 ppm helped in extended vase life of Chrysanthemum morifolium flowers.* ***Nair et al.*** *recorded that foliar spray of 30:20:20 NPK at weekly interval recorded more number of flowers of Dendrobium cv. Singapore White with significantly longer spikes.*

*Crop production is directly influenced by pollinators. Decline in honey bee population is a serious concern and to conserve the pollinators community approach through ecosystem services is required.* ***Rami Reddy*** *reports the benefits of having ornamental plant Mexican Creeper (Antigonon leptopus) as forage plant. This creeper attracted all the four species of honey bees studied. This creeper can be used as bioindicator of honey bee population.*

***Aravindaraj et al.*** *have reported the honey dew secretion by Thrips palmi and analysed the composition of it. They had identified different sugars present in the honey dew secretion of Thrips. Thrips not only cause direct damage but act as vectors of many plant viruses. Management of diseases in perennial crops is a challenge. Phytophthora incited root infection in citrus needs concerted efforts.* ***Ingle et al.*** *have demonstrated that use of potassium salt of phosphonic acid could help in management of Phytophthora root rot in Nagpur Mandarin.*

*Mushrooms can fill the gaps in nutritional security as they are rich in nutritive value. Iron deficiency is important issue to be addressed. Iron fortified oyster mushroom products have been developed by* ***Pandey et al.*** *The bioavailability of iron from Arka Mushroom Fe-Fortified Rasam Powder has been confirmed. In another study, the amino acid profile of 18 isolates of oyster mushroom species belonging to 4 species have been documented by* ***Azeez et al.*** *Quantification of essential and non-essential amino acids has been reported. Nutritionally superior isolates can be selected from these isolates.*

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***S. Sriram***
*Editor in Chief*

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**Short Communication**

# First report on honeydew excretion by the melon thrips, *Thrips palmi* karny (Thysanoptera : Thripidae) and its biochemical analysis

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## ABSTRACT

**Sap sucking insects like thrips, aphids, mealybugs, whiteflies exploit the sugar rich phloem for growth and development. The excess sugar in the phloem sap creates osmotic imbalance leading to loss of water from haemolymph to gut lumen. In order to maintain osmolarity, sap sucking insects have developed structural adaptation (filter chamber) and also excrete excess sugar as honeydew through various orifices. The excreted honeydew is known to play very vital ecological role such as natural enemy calling (attracting parasitoids). In this regard scanty information is available on this important aspect for different sap sucking insects. In this study we are reporting for the first time on the composition of honeydew from the major horticultural thrips, *Thrips palmi* reared on French bean (*Phaseolus vulgaris*). LC-MS-MS analysis revealed the presence of 15 different sugars majorly inositol, fructose, maltose, glucose and sorbitol @ (130.9 ±0.47µg); (95.1±0.45µg); (60.7 ±0.28µg); (54.2 ±0.40µg) and (28.1 ±0.35µg), respectively.**

**Keywords:** Honeydew, LC-MS-MS and Sugars and *Thrips palmi*

Sap sucking insects such as thrips, aphids, whitefly, mealybugs, leafhoppers, psyllids *etc.* feed primarily on the phloem sap which is rich in sugars such as sucrose, fructose, trehalose, maltose, raffinos, meteoritose *etc.*; free amino acids such as asparagine, glutamine, glutamate and serine (Hijaz and Killiny, 2014). Feeding of sugar rich sap leads to differential osmolarity between the hemolymph and gut lumen. To maintain the osmolarity between the gut lumen and the haemolymph, phloem feeders have developed several adaptations such as filter-chamber for efficient water usage and to excrete excess sugars in the form of honeydew through different orifices such as cornicles in aphids and anus in many other sap sucking insects. Honeydew acts as a medium through which insecticides are excreted and thereby contribute to the development of resistance to insecticides. This excretion of copious amount of honeydew on crops serves as substrate for the development of many saprophytic fungi like *Capnodium* sp., which affects photosynthesis (Lin, 2006; Wallace, 2008; Neto, 2011). It is also reported to be involved in natural enemy calling, which is self-inimical and provide food for ants which ensures dispersal and protection from the predators (Leroy *et al.*, 2011). It has also been documented that honeydew is also a source of food for parasitoids involved in biological control. Rate of honeydew excretion and its composition by aphids and whiteflies is well studied, but the information on honeydew excretion by thrips is not studied in detail. Hence, a study was conducted to understand the pattern of honeydew excretion by the melon thrips, *T. palmi* due to its significance as a polyphagous pest and an important vector of *Watermelon bud necrosis virus* and *Groundnut bud necrosis virus* in India.

Stock culture of *T. palmi* was maintained on French bean (*Phaseolus vulgaris* CV. Arka Komal) pods at a temperature of 25±2°C and 68±% RH (Rebijith *et al.*, 2011). One hundred adults of *T. palmi* were released on fresh French bean pods

*This is part of Ph.D. thesis of first authour submitted to Jain (Deemed to be ) University , Bengaluru* of approximately equal size (3cm surface width; 13 cm length and 6 g in weight) which were harvested from the French bean plants grown under insect proof cages. The samples with thrips were placed inside a plastic container (10cm x10cm) and kept at the room temperature (25±2°C, 68±% RH). There were three replicates and same replicates of control (without inoculating *T. palmi*) were also maintained. Observations were made continually on the behavior of *T. palmi* adults and for the excretion of honeydew under the stereo-zoom microscope Stemi 305 (ZEISS, Germany).

Sugars were separated by following modified Steppuhn and Wackers (2004) method. After 24 h observation, the bean pods were washed with 10 mL of 80% ethanol, and the extract was evaporated and re-dissolved in mobile phase containing solvent A and solvent B in 1:1 ratio, filtered and injected to LC–MS/MS for sugar profiling.

Sugar standards *viz.* fructose, sucrose, galactose, glucose, maltose, fucose, rhamnose, xylose, arabinose, mannose, sorbitol, inositol, lactose, ribose and trehalose were purchased from Sigma Chemical Co., USA and calibration curve was prepared using different concentration of individual sugars. The mobile phase used was composed of solvent (A) 80:20 (Acetonitrile: Water) and solvent (B) 30:70 Acetonitrile: water with 0.1% ammonium hydroxide was filtrated through 0.2 µm nylon filter paper and separation was done using gradient elution. The initial gradient was composed of 100% solvent A for one min and at $8^{th}$ min it was champed to 88% of solution A and 12% of solution B, which was held for 1 mint and a linear gradient was followed by 98% of solution A and 2% of solution B and at $15^{th}$ mins it was held for 30 sec. The system had returned to initial settings at $19^{th}$ min and equilibrated for 6 min. before the next injection and the flow rate was 0.1mL/min. The analytical column used was 2.1x10 mm UPLC BEH-Amide (Waters, USA) with 1.7 µm particle size and protected by vanguard BEH-Amide with particle size 1.7 µm. The column was maintained temperature of 25°C.

Study was conducted to understand the pattern of honeydew excretion by the melon thrips. Close observation under the stereo microscope revealed that *T. palmi* adults excrete honeydew which lasted for about 10 sec from initiation bending of abdomen to the release. These events were recorded in VLC format. Analysis of sugars in the honeydew revealed that there was a significant difference between the control samples and samples inoculated with thrips. Among the sugars estimated, inositol was the predominant sugar (130.95 ±0.47 µg/pod) in the honeydew followed by fructose (95.13 ±0.45 µg/pod); maltose (60.700 ±0.28µg/pod); glucose (54.22 ±0.40µg/pod); sorbitol (28.15 ±0.35g/pod) (Fig: 2) followed by less of lactose, mannose, galactose, arabinose, ribose and fucose (Table 1). It clearly indicated that the honeydew excreted by thrips is rich in soluble sugars. There is a single report on honeydew excretion by the red banded thrips, *Selenothrips rubrocinctus* (Giard) (Buss *et. al.,* 2006). Wool *et al.* (2006) reported about 20 sugars in the honeydew excreted by aphids. Glucose and fructose are basic components of the honeydew of sap feeding insects (Fischer *et al.,* 2005; Wool *et al.,* 2006). These sugars are present in honeydew in different proportions depending on the insect species and host plants. Hendrix *et al.* (1992) also observed the differences in sugar composition of honeydew excreted by *Trialeurodes vaporariorum* (Westwood) and *Bemisia tabaci* (Gennadius) feeding on different host plants.

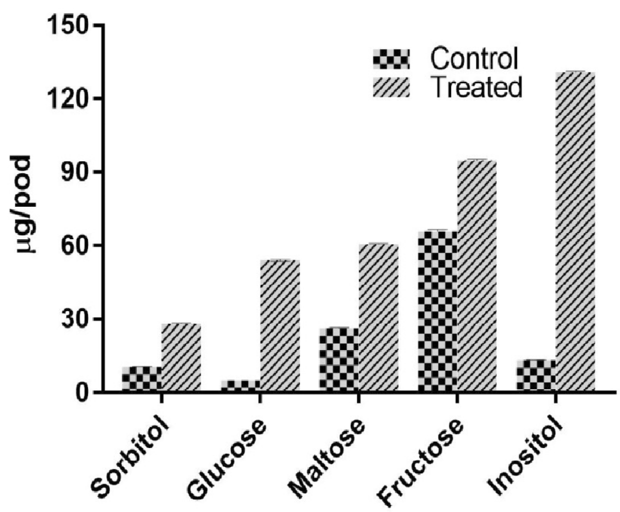


**Fig. 1. Contents of major water soluble sugars in beans with or without thrips infestation**

**Table 1. Biochemical analyses of water-soluble sugars by LC-MS-MS in the bean pods with or without thrips infestation**

| Sugar | Control (±SE) | Treated (±SE) |
|---|---|---|
| Ribose | 0.930±0.00 | 3.860±0.05 |
| Arabinose | 0.553±0.00 | 3.907±0.04 |
| Xylose | 3.690±0.08 | 0.683±0.02 |
| Rhamnose | 0.030±0.00 | 0.163±0.00 |
| Fucose | 0.010±0.00 | 0.020±0.00 |
| Glucose | 5.190±0.02 | 54.227±0.40 |
| Fructose | 66.253±0.56 | 95.137±0.45 |
| Galactose | 1.757±0.08 | 4.293±0.23 |
| Mannose | 5.100±0.09 | 5.253±0.07 |
| Inositol | 13.360±0.03 | 130.957±0.47 |
| Sorbitol | 10.660±0.09 | 28.153±0.35 |
| Maltose | 26.420±0.12 | 60.700±0.28 |
| Lactose | 0.907±0.00 | 3.820±0.04 |
| Sucrose | 0.343±0.00 | 0.890±0.01 |
| Trehalose | 0.010±0.00 | 0.030±0.00 |
| Total | 135.213±1.12 | 392.093±2.46 |

Differences in chemical composition of honeydew secreted by aphids are explained inter alia by genetic variation between insect populations (Fischer and Shingleton, 2001). However, the host plant sap is a primary factor that influence the diversity in biochemical composition of honeydew. Honeydew composition is an important factor in tri-tropic interaction involving natural enemies and also mediating ant–homopteran mutualisms. However, further studies on sugar composition in relation to species of ants attracted and its impact on predation/parasitism is required in order to have sustainable management of this pest.

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# New Varieties/ Technologies of ICAR-IIHR

New Water Melon - Arka Shyama variety

Arka Red - New Gerbera variety

Leaf curl resistant chilli varieties Arka Tejaswi, Arka Saanvi and Arka Tanvi

Arka Abhi

Arka Shuba

# New Varieties/ Technologies of ICAR-IIHR

Arka Herbiwash - Safe way of removing pesticide residues


Arka Bharath - New teasel gourd variety

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