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Phagostimulant and deterrent fractions in *P. bombycina* (host) and *L. grandifolia* (non host): detection by chemosensory organs of *A. assama* Westwood.

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INTRODUCTION

There is long standing debate as to how animals identify and discriminate taste stimuli.The golden yellow muga silk producing insect *Antheraea assama*, thrives primarily on *Persea bombycina* and *Litsea polyantha*. Such insects with restricted diet breadth are ideal for understanding the role of plant chemicals on food selection and mechanism of detection of taste stimuli by insects. We undertook this study to evaluate phagostimulatory and deterrent fractions in the host (*Persea bombycina:* Lauraceae) and acceptable non-host (*Litsea grandifolia :* Lauraceae) of *A.assama* through participation of chemosensory organs.

MATERIALS AND METHODS

Leaves of host and non host plants were extracted in ethanol , petroleum ether and diethyl ether. The diethyl ether extract was further fractionated into neutral, polar lipids, non polar lipids, acids, water soluble components and alkaloids by using different solvents [1] .

Larvae having chemosensory organs-Maxillary palp. Labrum-epipharynx and galeal sensilla styloconica remaining individually and all organs together unilaterally and bilaterally after microsurgery were subjected to food choice test [2]. Choice was given individually between food disc (Glass fibre) laced with plant fraction and water . Differences in food choices were expressed in a choice index (-100 to 100) based on time required for consumption of fifty percent of food disc. Positive index indicated phagostimulating and negative index indicated phagodeterring chemical fraction. Biting rate was counted from zero hour of feeding for 30 sec (n=30). A two tailed Mann-Whitney test was used for determination of significance of difference in food choices. Kruskal Wallis sign ranked test was used for determining significance of biting count.

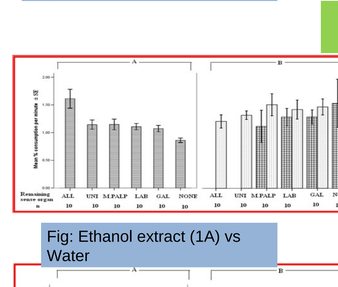
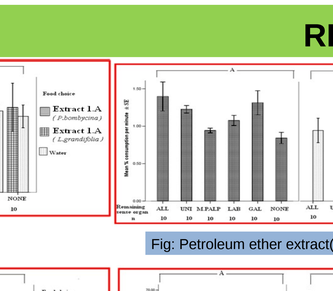


Fig: Location for ablation



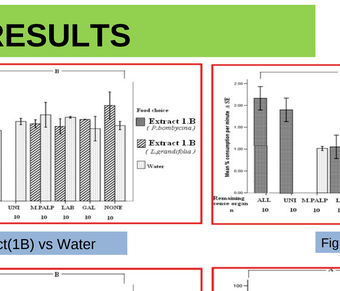


Fig: Ablated larvae feeding on treated glass fibre disc

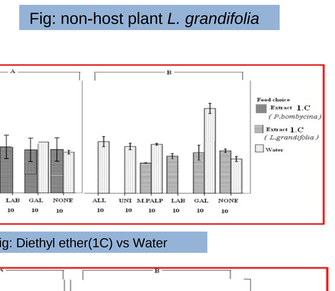


Fig: Host plant *P. bombycina*

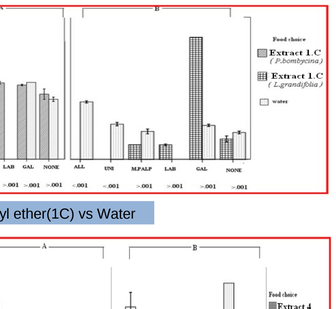


Fig: non-host plant *L. grandifolia*

RESULTS

Fig: Ethanol extract (1A) vs Water

Fig: Petroleum ether extract(1B) vs Water

Fig: Diethyl ether(1C) vs Water

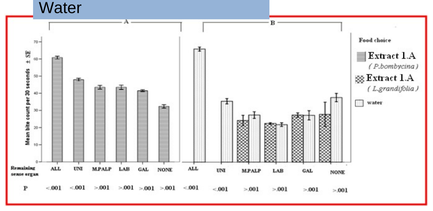


Fig: Ethanol extract(1A) vs Water

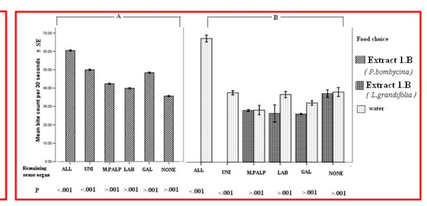


Fig: Petroleum ether extract(1B) vs Water

Fig: Diethyl ether(1C) vs Water

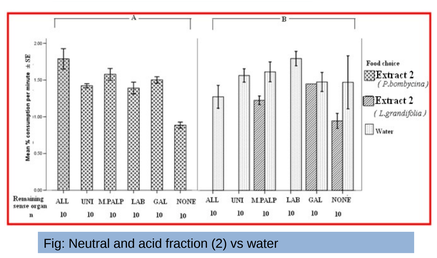


Fig: Neutral and acid fraction (2) vs water

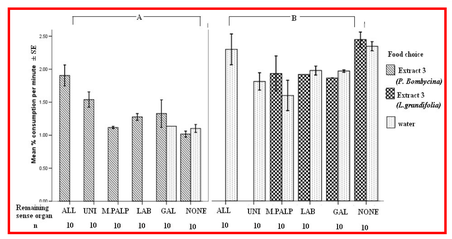


Fig: Acid alkaloids and water solubles(3) vs Water

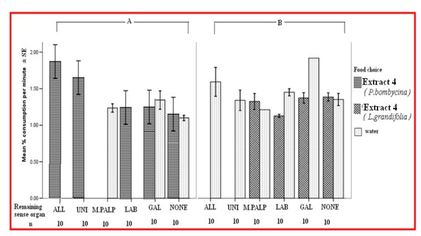


Fig: Neutral fraction (4) vs Water

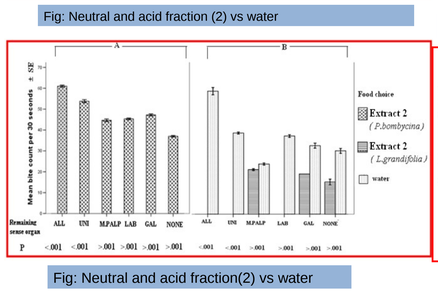
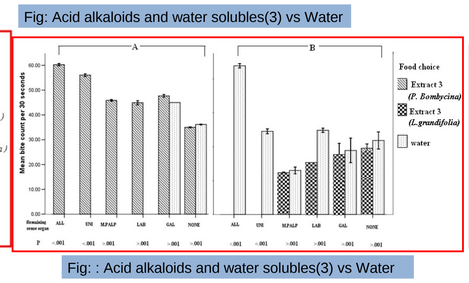


Fig: Neutral and acid fraction(2) vs water



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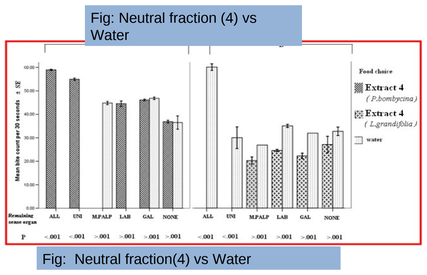


Fig: Neutral fraction(4) vs Water

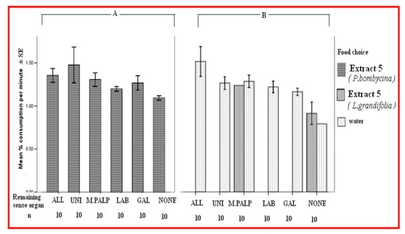


Fig: Basic phase with acid (5) vs Water

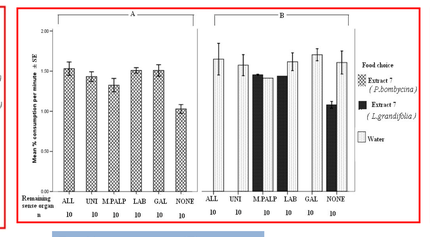


Fig: Non polar lipid (7) vs Water

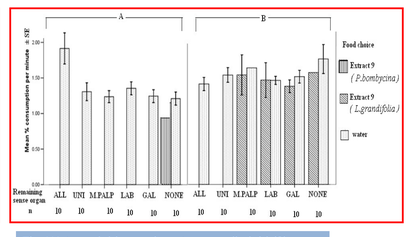
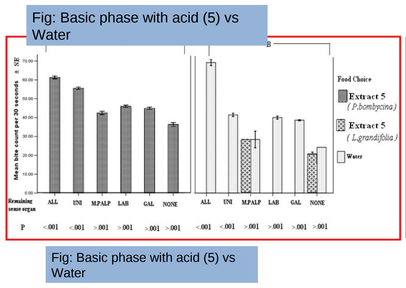


Fig: Water solubles and quaternery alkaloid (9) vs Water



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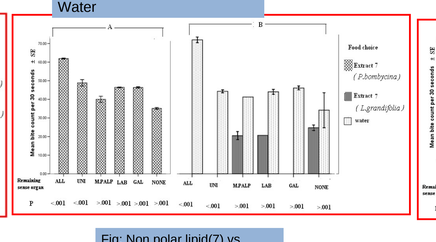

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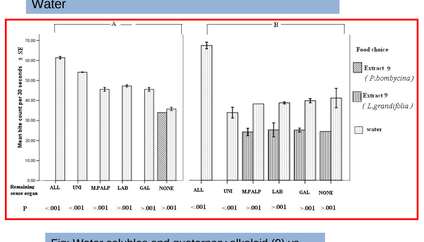

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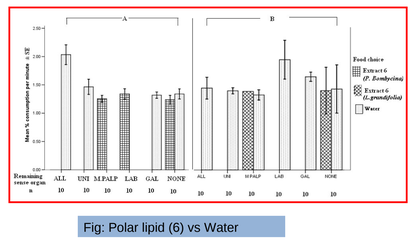

Fig: Polar lipid (6) vs Water

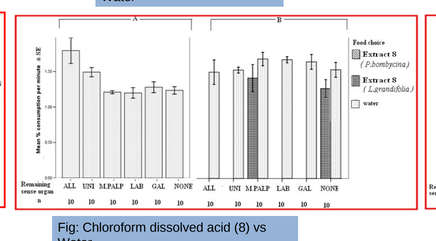

Fig: Chloroform dissolved acid (8) vs Water

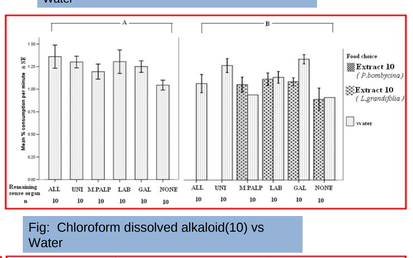

Fig: Chloroform dissolved alkaloid(10) vs Water

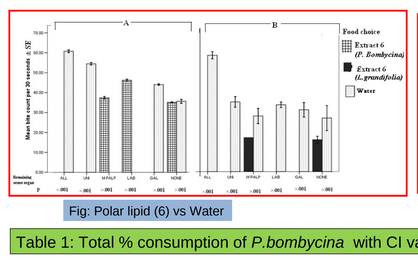

Fig: Polar lipid (6) vs Water

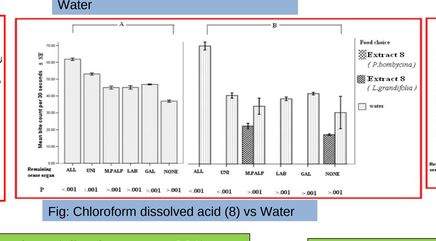

Fig: Chloroform dissolved acid (8) vs Water

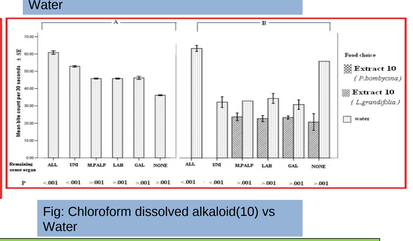

Fig: Chloroform dissolved alkaloid(10) vs Water

Table 1: Total % consumption of *P.bombycina* with CI values (all values are <.001)

Extract No	All	Uni	M.Palp	Lab	Gal	None
1A	100	100	100	100	100	60
1B	100	100	100	100	100	100
1C	100	100	-100	100	60	-20
2	100	100	100	100	100	100
3	100	100	100	100	60	20
4	100	100	-100	100	20	20
5	100	100	100	100	100	100
6	-100	-100	100	100	-100	20
7	100	100	100	100	100	100
8	-100	-100	-100	-100	-100	-100
9	-100	-100	-100	-100	-100	-100
10	-100	-100	-100	-100	-100	-100

Table 2: Total % consumption of *L.grandifolia* with CI values (<.001)

Extract No	All	Uni	M.Palp	Lab	Gal	None
1A	-100	-100	-20	20	20	-20
1B	-100	-100	-20	20	20	20
1C	-100	-100	-20	+100	-60	20
2	-100	-100	20	-100	-60	20
3	-100	-100	20	-60	-20	20
4	-100	-100	60	-20	60	-20
5	-100	-100	60	-100	-100	60
6	-100	-100	-60	-100	-100	20
7	-100	-100	60	-60	-100	20
8	-100	-100	-20	-100	-100	20
9	-100	-100	60	-20	20	-60
10	-100	-100	60	20	-20	60

Diethyl ether extract of host *P. bombycina* possessed deterrent chemicals detected by maxillary palp and galea. The deterrents belonging to polar lipid and alkaloid fractions detected by galeal sensilla styloconica and the ones belonging to acid fractions were detected by maxillary palp, labrum-epipharynx and galeal sensilla styloconica. Acids in essential oil of *P. bombycina* was shown to antagonize growth and silk production [3] .Water solubles like sugar, amino acids and non polar lipids were stimulatory to all gustatory organs. Stimulating role of non polar lipid in food preference was reported earlier in Tobacco hornworm [4].

Diethyl ether extract of non host *L. grandifolia* possessed feeding stimulatory fractions detected by labrum-epipharynx. Feeding deterrent fraction of polar lipid and acids were detected by galea and lab-epi while non polar lipid was detected by galeal sensilla only. Water solubles and alkaloids possessed low feeding stimulating components detected by all gustatory sensilla. Rejection by control larvae may indicate a CNS integration or stronger role of deterrent cells causing feeding inhibition for acceptable non host. Further study is required for confirmation..

CONCLUSION

1.Both host and non host plants of *A. assama* larvae possess feeding stimulatory and deterrent chemicals.
2.Deterrent cells of galeal sensilla styloconica and sensilla on labrum-epipharynx of *A. assama* larvae determine food rejection behaviour. Sensilla on maxillary palpi , galea and labrum-epi determine food acceptance.
3.The final acceptance and rejection by the larva probably depends on balance of stimulation by phagostimulant and deterrent chemicals in food plant as integrated in CNS.

REFERENCES

1.De Boer G, Schmitt A, Zavod R , Mitscher LA.1992. J. Chem. col.18(6) :885-895. 2. De Boer G, Hanson FE. 1987. Physiol Entomol. 12: 387-398.
3.Choudhuri SN, Vajczikova,I. 2006. Muga silk (*Antheraea assama*) Biochemistry Biotechnology Molecular biology Ed. By Unni BG. RRL, Jorhat,Assam.
4 . De Boer G, Hanson FE. 1988. J.Chem.ecol. 14 :669-682.

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