Int. J. Chem. Sci.: 6(1), 2008, 1-6

PRELIMINARY PHYTOCHEMISTRY OF *IPOMEA CARNEA* JACQ. AND *VITEX NEGUNDO* LINN. LEAVES

K. SAHAYARAJ* and C. RAVI

Crop Protection Research Centre, St. Xavier's College, PALAYAMKOTTAI – 627 002 (T. N.) INDIA

ABSTRACT

The result of this study reveals that the uptake and transformation of plant natural products and volatiles constitute an important array of substances governing the sensitivity of the herbivore in food selection. Hence, an understanding of the variability of secondary metabolites and their role in insect repellence need attention in near future. The preliminary phytochemical analysis of *I. carnea* and *V. negundo* showed the presence of compounds such as phenols, saponins, xathoproteins, triterpenoids, tannins and flavonoids. The major compounds identified through GC-MS in *V. negundo* are 1H-indene, cyclododecanol, patchoulane, 1,2-dihexylcyclopropene-3-carboxylic acid, 2-heptenoic acid, (+) - aromadendrene, trans-caryophyllene, 7-oxabicyclo [4.1.0] heptane, cyclohexane, farnesol, pentadecane and 1-octanol. Neophyadiene, 1-decanol, tetradecanoic acid, pentadecane, 1-iodo-2-methylundecane, trans-caryophyllene, eicosane, 2-butenoic acid and cholestan-3-one are the major secondary metabolites in *I. carnea*. Further identification of the compounds through IR, NMR etc. is necessary to find out the exact compound responsible for insecticidal property.

Key words: *Ipomea carnea*, *Vitex negundo,* Phytochemistry

INTRODUCTION

Ipomea carnea Jacq. and *Vitex negundo* Linn. leaves have been used for medicinal and agricultural purposes by the humankind. Compounds such as flavonoids, casticin, chrysoplenol D, lutcolin, isoorientin, p-hydroxybenzoic acid[1]; 4-4-dimethoxy-trans-stilbene[2]; lignan[3]; iridoids[1]; sabinene, p-cymene, β-phelladune, γ-terpinene, terpinen-4-ol, β–caryophyllene, globul and viridifloral[4]; mono and sesquiterpenes[5]; viridiflorol, β-eudesmol and β–caryophyllene[6, 7] were identified so far in *V. negundo* (VN). Published works are not available for *Ipomea carnea* Jacq. (IC). However, amino-oxy-β-phenyl propionic acid was identified in a related species *Ipomea tricolor*[8]. Present study was undertaken to know the preliminary phytochemicals (both qualitatively and qualitatively) present in various solvent extracts of *Vitex negundo* and *Ipomea cornea* leaves and

* Author for correspondence; E-mail: ttn_ksraj@sancharnet.in

identification of compounds using GC-MS.

EXPERIMENTAL

Collection and extraction of plant material

V. negundo leaves were collected from St. Xavier's College campus and home gardens in and around Palayamkottai, Tirunelveli District, Tamil Nadu, India. *I. carnea* leaves were collected from Elanthakulam eutrophicated lake, Palayamkottai, Tirunelveli District, Tamil Nadu, India. They were brought to the laboratory and washed well with tap water (2 to 3 times) and shade dried. After three weeks, they were powdered using a domestic grinder. It was successively extracted with benzene, chloroform, and water using Soxhlet apparatus (300 g, 500 mL). The last trace of solvent was removed under reduced pressure distillation and the crude extract was dried in a vacuum desiccator and used for the experiments.

Qualitative and quantitative estimation of phytochemicals

The different extracts were tested for steroids, alkaloids, reducing sugars, phenolic compounds, saponins, xanthoproteins, tannins and flavonoids[9]. Total tannin, phenols and flavanoids were using tannic acid[10], catechol[11], keempferol[12] and expressed the results as optical densities.

Identification of compounds

Both the benzene and chloroform, extracts of *I. carnea* and *V. negundo* were purified using benzene and chloroform, respectively. Fractions of *I. carnea* (10 to 50 and 25 to 55 for benzene and chloroform, respectively) and *V. negundo* (20 to 40 and 15 to 50 for benzene and chloroform, respectively) were collected and subjected to the compound identification using GC-MS (model GC-MS - QP 500, Shimadzu, Singapore) at a flow rate of 31.6 mL/minute and a split ratio of 33. The initial temperature was 70^0 C for five minutes and for every 5 minutes thereafter, 10^0 C was increased up to 260^0 C and it was allowed to stand for 20 minutes. The peaks of the compounds obtained were compared with the already available compounds catalogue (class - 5000 software, Wiley 139. Library) and then predicted and interpreted.

RESULTS AND DISCUSSION

Qualitative phytochemistry

Plants are rich sources of chemical compounds, pigments, steroids *etc*.[13]. Generally

plants are able to synthesize a variety of chemical substances such as non-protein amino acids, alkaloids, terpenes, flavonoids and their chemical diversity has increased greatly during the course of evolution along the periodical changes in insect feeding pressure. The preliminary qualitative phytochemical analyses of *I. carnea* and *V. negundo* benzene extract (BE), chloroform extract (CE) and water extract (WE) are shown in Table 1. WE of both the plants showed the presence of carbohydrates, phenolic compounds, saponins, xanthoproteins, tannins and flavonoids. The CE of *V. negundo* had compounds like steroids, phenolic compounds, triterpenoids, saponins and tannins. But the BE showed only steroids, carbohydrates, saponins and flavanoids. Carbohydrates, phenolic compounds, saponins and tannins are present in the BE of *I. carnea*. CE showed the presence of steroids, carbohydrates, alkaloids, phenolic compounds, saponins, xanthoproteins and flavonoids.

Table I. Preliminary qualitative phytochemical analysees of various extracts of *I. carnea* and *V. negundo*

Secondary chemicals	*I. carnea*			*V. negundo*		
	Chloro-form	**Benzene**	**Water**	**Chloro-form**	**Benzene**	**Water**
Steroids	+	-	-	+	+	-
Triterpenoids	+	+	-	+	+	-
Carbohydrates	+	+	+	+	+	+
Alkaloids	+	-	-	-	-	+
Phenolic compounds	+	+	+	+	-	+
Saponins	-	+	+	+	+	+
Xantho proteins	-	-	+	-	-	+
Tannins	+	+	+	+	-	+
Flavonoids	+	-	+	+	+	+

+ indicates present and – indicates absent

Quantitative phytochemistry

Results of quantitative estimation revealed that *V. negundo* possess 0.175 mg/g, 33.8 µg/mg and 50.00 µg/mg of total phenols, tannins and flavonoids, respectively. *I. carnea* contains more amount of total phenol, tannins and flavonoids (0.285 mg/g, 37.5

μg/mg and 82 μg/mg, for phenol, tannins and flavonoids, respectively). Dayrit and Lagurin[14] reported the high amount of flavonoids in *V. negundo*. One of the features of secondary metabolism is to cope with and adapt to a continually changing environment relates to chemical diversification, with intra-population variation being inherent. Furthermore, tannins are also an important secondary metabolite, which has antibacterial, antifungal and antiviral activities. In addition, literature also revealed that it also has insecticidal activity against *Spodoptera litura* (Fab.). Published works also evidenced the occurrence of tannins in large proportions of genera in more ancient angiosperms than in recent taxa.

GC-MS analyses

The peaks obtained in the GC-MS analysis for the extracts of both the plants are given in Table 2. The major compounds present in the benzene and chloroform extracts of *V. negundo* are 1H-indene, cyclododecanol, patchoulane, 1,2-dihexylcyclopropene-3-carboxylic acid, 2-heptenoic acid, (+) – aromadendrene, trans-caryophyllene, 7-oxabicyclo [4.1.0] heptane, cyclohexane, farnesol, pentadecane and 1-octanol. Tetramethoxyflavone, trimethoxyflavone, ascerosin and 5-glucosylrhamnoside; casticin, chrysoplenol D, lutcolin, isooxientin, p-hydroxybenzoic acid[14]; 4-4-dimethoxy trans-stilbene[1]; iridoids[3]; sabinene, p-cymene, β-phelladune, γ-terpinene, terpinen–4–ol, β–caryophyllene, global and viridiflorol[4]; mono and sesquiterpenes[5]; viridiflorol, β-eudesmol and β-caryophyllene[6] have been reported earlier from this plant.

Table 2. Major compounds present in benzene (BE) and chloroform (CE) extracts of *V. negundo* and *I. carnea* by GC- MS

Solvents	Name of the compound	Retention time	Area	Molecular weight
	V. negundo			
BE	1-H-Indene	13.888	659290	206
	Cyclododecanol	16.509	3070370	184
	Patchoulane	16.897	523637	206
	1, 2-Dihexylcyclopropene-3-carboxylic acid	18.039	912959	252
	2-Heptenoic acid	20.211	2176431	194
	(+) - Aromadendrene	20.295	1564021	204

Solvents	Name of the compound	Retention time	Area	Molecular weight
CE	trans-Caryophyllene	10.817	958382	204
	7-Oxabicyclo [4.1.0] heptane	18.053	415325	140
	Cyclohexane	20.228	596939	178
	Farnesol	28.250	245578	222
	Pentadecane	24.055	1922006	212
	1-Octanol	25.756	2087347	186
	I. carnea			
BE	Neophyadiene	14.084	2471308	326
	1-Decanol	15.298	1116206	186
	Tetradecanoic acid	16.517	1570979	228
	Pentadecane	22.718	3743168	212
	1-Iodo-2-methylundecane	24.057	7096486	296
	Trans-caryophyllene	25.472	1695068	204
	Eicosane	25.742	2585936	282
CE	2-Butenoic acid	22.702	2082610	532
	Cholestan-3-one	24.035	3204781	444

The *I. carnea* benzene and chloroform extracts yielded the compounds such as neophyadiene, 1-decanol, tetradecanoic acid, pentadecane, 1-iodo-2-methylundecane, trans-caryophyllene, eicosane, 2-butenoic acid and cholestan-3-one. Cholestan-3-one is a steroidal compound and it has a high insecticidal property. Literature is scarce regarding the chemical constituents of *I. carnea.* The related species *Ipomea tricolor* had α-amino-oxy-p-phenyl propionic acid. Since these plants are having tannins and insecticidal compounds like cholestan-3-one, they can be included in the insect pest management programme.

ACKNOWLEDGEMENTS

Senior author thanks Department of Biotechnology, New Delhi for the financial assistance provided to him. We are grateful to Rev. Dr. A. Antonysamy, S.J., Principal and Prof. Thomas Punithan, Head, Dept. of Advanced Zoology and Biotechnology, St.

Xavier's College, Palayamkottai for the laboratory facilities and constant encouragement throughout the study.

REFERENCES

1. F. M. Dayrit, M. A. R. G. Lapid, J. V. Cagampang and L. G. Lagurin, Phil. J. Sci., **116(4)**, 403 (1987).
2. J. Banerji, B. Das and R. Chakrabarthy, Indian Journal of Chemistry, **27B(6)**, 597 (1988).
3. A. A. Chawla, A. K. Sharma, S. S. Handa and K. L. Dhar, Phytochemistry, **31(12)**, 4378 (1992).
4. G. R. Mallavarpu, S. Ramesh, P. N. Kaul, A. K. Bhattacharya and B. R. Rajeswara Rao, Planta Medica, **60(6)**, 583 (1994).
5. L. Jirovetz, G. Buchbauer and C. Puschmann, Acta Pharmaceutica, **48(3)**, 179 (1998).
6. R. Dayal and V. Singh, J. Med. Arom. Plant Sci., **21**(Suppl. 1), 44 (1999)
7. R. Dayal and V. Singh, J. Med. Arom. Plant Sci., **22(1B)**, 639 (2000).
8. V. Singh, A. Srivastava, M. Pandey, V. Srivastava and R. Sethi, Res. J. Chem. Environ., **6(1)**, 9 (2002).
9. P. Brindha, B. Sasikala and K. Purushothaman, *BMEBR*, **111(1)**, 84 (1981).
10. S. H. Schanderl, in "Method in Food Analysis" Academic Press, New York, USA. (1970) p. 709.
11. C. P. Malick and M. B. Singh, in: Plant Enzymology and Histoenzymology, Kalyani Pub., New Delhi, India. (1980) p. 286.
12. T. Swain and W. E. Hillis, J. Sci. Food Agric., **10,** 63 (1959).
13. M. Barenbaum, Postingestive effects of phytochemicals on insects: on paracelsus and plant products. in : "Insect Plant Interactions, J. Miller and T. Miller (Eds.) Springer-verlag, New York. (1986) pp. 221.
14. F. M. Dayrit and L. G. Lagurin, Phill. J. Sci., **123(4)**, 293 (1994).

Accepted : 19.11.2007