Plants having molluscicidal activities and their active components against harmful freshwater snail *Lymnaea acuminata* in eastern Uttar Pradesh

Abstract: Many aquatic snails acts as intermediate hosts for the larvae of trematodes, *Fasciola hepatica* and *Fasciola gigantica*, which cause the diseases fascioliasis and schistosomiasis .With growing awareness of environmental pollution efforts are being made to discover molluscicidal products of plant origin.

Key Words: molluscicides, snail

Introduction : Several plants exhibit molluscicidal activity against *Lymnaea acuminata*, with the active components varying. Some plants and their associated active components include:

- ***Ferula asafoetida*:** Dried root latex powder; one study identified ferulic acid and umbelliferone as active components.
- ***Syzygium aromaticum*:** Flower-bud powder; eugenol is identified as the active molluscicidal component.
- ***Carum carvi*:** Seed powder; limonene is identified as the active molluscicidal component.
- ***Lantana indica*:** Leaves and other parts; various traditional medicine uses are linked to its molluscicidal potential.
- ***Thevetia* peruviana, Alstonia scholaris, *Euphorbia pulcherrima*, and *Euphorbia hirta*:** Aqueous extracts; these plants have shown potent molluscicidal activity.
- ***Carica papaya*:** Papain is a potent molluscicide.
- ***Areca catechu*:** Arecoline is an active component.
- ***Myristica fragrans*:** Myristicin is an active component.
- ***Saraca asoca:*** Bark powder; saponin is identified as the active molluscicidal component.
- ***Thuja orientalis*:** Leaf powder; thujone is identified as the active molluscicidal component.
- ***Bauhinia variegata:*** Leaves; saponin is identified as the active molluscicidal component.
- ***Mimusops elengi*:** Bark; quercetin is identified as the active molluscicidal component.
- ***Sapindus mukorossi*:** Fruit powder; saponin is identified as the active molluscicidal component.
- ***Terminalia chebula*:** Fruit powder; tannic acid is identified as the active molluscicidal component

Active moieties that make up plants: The most abundant sources of bioactive, renewable organic compounds are plants. There may be about 400,000 different plant compounds in total 10,000 they're additional metabolites that possess a primarily defensive function in plants (Swain 1977; Cooper and Johnson 1984). Phenols, alkaloids, and terpenes are among the active ingredients found in plants used as Phyto pesticides (Abubakar et al. 2020). These compounds have already been found to have behavioural and physiological effects on pests (Singh and Agrwal 1988; Singh and Agrwal 1992 a, b; Singh 2000; Yadav 2000; Singh et al. 2000; Yadav and Singh 2001; Yadav and Singh 2003; Singh and Singh 2003 a, b, c; Singh et al. 2004 a, b, c; Singh and Singh 2005; Yadav et al. 2005; Yadav and Singh 2006; 2007; Singh et al. 2009; Singh et al. 2010 and Yadav et al. 2009). Among the substances that are physiologically active are:

Saponins: Natural plant glycosides called saponins are made up of a glycoprotein unit and a sugar moiety that form a soapy lather when water is added. While biodesmosidic saponins (sugar moiety at positions C-3 and C-28) are inactive, Monodesmosidic saponins (sugar moiety at position C-3) are poisonous. 9 Alkaloids: Alkaloids are organic bases found in nature that have at least one nitrogen atom attached to an aliphatic skeleton or in the heterocyclic ring. They are typically crystalline, colourless, non-volatile solids that dissolve minimally in water but readily in ether, ethanol, and chloroform.

Flavonoids: Any substance whose structure is derived from flavones is referred to as a flavonoid. Flavonoids are C15 compounds made up of 2 phenolic nuclei joined by three Caron units, with the exception of O-alkyl groups and subordinate substituents.

Diterpenoids: A class of chemicals with the general molecular formula $C_{22}H_{32}$ is known as diterpenoids. They are often derived from plants and are not volatile in steam. Highly poisonous effect against pests is exhibited by a novel class of diterpenes that are esters of phorbol (12-deoxyphorbol, 12-deoxy-16 hydroxy-phorbol, ingenol, 5 deoxy-ingenol resiniferatoxin, and tinyatoxin).

Monoterpenoids: The primary components of essential oils are monoterpenoids, which are composed of two isoprene units ($C_{10}H_{16}$).

Sesquiterpenoid: Compounds with a sesquiterpene backbone and an extra lactone ring are known as sesquiterpenoid lactones.

Iridoids: They are monocyclic monoterpenoids that lack the β-menthane structure and instead have a lactone ring.

Furanocoumarins: Furanocoumarins are a class of chemicals that have a furan ring bonded to the 1, 2 benzopyrene skeleton.

Tannins: The complex phenolic substances known as tannins fall under 2 categories: (i) hydrolysable tannins, which are gallic acid esters and their glycosides, and (ii) condensed tannins, which are polymers made from different flavonoids.

Conclusion: According to tests conducted over the past ten years, these plant products have insecticidal, anti-bacterial, molluscicidal, and piscicidal properties (Martson and Hostettmann 1985; Singh and

Agrwal 1988; Singh and Agrwal 1992 a, b; Singh 2000; Yadav 2000; Singh et al. 2000; Yadav and Singh 2001; Yadav and Singh 2003; Singh and Singh 2000; Singh and Singh 2003 a, b, c; Singh et al. 2004 a, b, c; Yadav et al. 2005; Yadav and Singh 2006; 2007; Singh et al. 2009., and Yadav et al. 2009; Patil et al. 2009). Numerous nations have encouraged the use of plant-based products that offer a variety of advantageous qualities, including: • High pesticidal qualities • Ease of availability • Ease of biodegradation with minimal environmental contamination risk • Minimal toxicity to mammals • Water Solubility • Affordable • Proliferate in endemic regions and are operator-safe.

References:

Singh, A. and Singh, S. (2005). Molluscicidal evaluation of three common plants from India. Elsevier, 76, 747-751.

Singh, A., Singh, D. K., Mishra, T. N. and Agrawal, R. A. (1996 a). Molluscicides of plant origin. Biol. Agric. Hortic., 13, 205-252.

Singh, D. and Singh, A. (2000). The acute toxicity of plant origin pesticides in to the freshwater fish Channa punctatus. Acta. Hydrochim. Hydrobiol., 28(2), 92 94.

Singh, D. and Singh, A. (2000). The acute toxicity of plant origin pesticides in to the freshwater fish Channa punctatus. Acta. Hydrochem. Hydrobiol., 28(2), 92 94.

Singh, D. K. and Agarwal, R. A. (1991). Action sites of cypermethrin, a synthetic pyrethroid in the snail Lymnaea acuminata, Acta Hydrochim. Hydrobiol. 19, 425–430.

Singh, J., Singh, A. K. and Pravesh, R. (2003). Production and trade potential of some important medicinal plants: An overview. In “Prpc. Of first National Inter. Meet on Medic. And Aroma. Plants”. (Ed. A. K. Mathur, S. Dwivedi, D. D. Patra, G.D. Bagchi, N. S. Sangwan, A. Sharma and S. P. S. Khanuja), pp.71 76.

Singh, K., Singh, A. and Singh D.K. (1998). The use of piperonyl butoxide and MGK 264 to improve the efficacy of some plant derived molluscicides, Pestic. Sci. 54, 145-149.

Singh, K., Singh, A. and Singh, D. K. (1995). Molluscicidal activity of different combinations of plant products used in the molluscicides. Pestoban. Biol. Agric. Hortic. 12, 253-261.

Singh, K., Singh, A., and Singh, D. K. (1996 b). Molluscicdal activity of Neem (Azadirachta indica). J. Ethanopharmacol., 52, 35-40.