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ENVIRONMENTAL CONSERVATION THROUGH PLANTS OIL

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ABSTRACT

Biodiversity is prevalent in terrestrial as well as aquatic inhabitat suffuring from attack of predators at successice trophic level so present work has taken into consideration to evaluate the different oil from different plants like *Chenopodium ambrosioides, Trachyspermum ammi* and *Derris indica* for the removal of predators in aquatic life. The survival period of these insects under plant oils dicreases.

Key words: plant oil, insects

The effect of plant oil was studies as insecticides to control aquatic insects. Aquatic insects are among the most diverse groups of animals of especially small water bodies. Aquatic insects are those that spend more part of their life cycle closely associated with water, either living beneath the surface or skimming along on top of water. Out of total insects only 5% are aquatic. This high biodiversity can be found not only in terrestrial but also in marine and fresh water habitats. They are abundant in a great variety of aquatic ecosystems and enrich their highest diversity in clean, fast flowing mountain rivers and streams. Several aquatic insect species, from different orders, has been described from Costa Rica by the end of the 19th and the beginning of 20th century (Sharp 1882, Eaton 1892, Calvert 1892-1908, 1911a, b, 1915, 1917, 1920 a,b, 1923, Pittier & Biolley 1895, Champion 1897-1901, Cresson 1918, Banks 1914a, b, Navas. 1924). The origin of aquatic insects has been controversial and doubts still exists as to whether or not insects are primarily or secondarily adapted to aquatic environments. Living aquatic insects represent 12 insect orders. Aquatic insects have tacked the problem of living in aquatic environment by evolving into various morphological and physiological modifications. Essentially all aquatic insects are omnivorous, atleast in their early instars. Aquatic insects have been traditionally considered as generalist predators (Cummins 1973, Peckarsky 1982). Fishes are aquatic vertebrates, they are of tremendous importance as food for people around the world. They play a significance role in the life of mankind, because fishes are good source of animal's proteins, fat, vitamins A,D & K and fish oil. Fisheries development also holds the promise of generating employment potential and subsequently achieves the social and economic advancement of the fishing community. Nursery ponds designed to rear spawn of major carps are invariably populated with these large numbers of aquatic insects over greater part of year, especially during and after rain. Fish culturist likes to produce maximum amount of good quality fish so as to earn handsome profit. This is possible by good care, management and control of aquatic predatory insects. Pakrasi, 1954 has developed a method of controlling predatory insects through an emulsion of mustard or coconut oil and cheep washing soap in the ratio of 56:18 kg. ha. Predatory aquatic insects multiply rapidly between initial poisoning and stocking the pond. Many aquatic insects also fly from pond to pond. Thus, a pond which has been effectively cleared of its insect population is soon repopulated with insects.

MATERIAL & METHODS

A suitable & economically cheap method must be employed to control aquatic insects. Spraying oil along with toxic insecticides to kill the insects by amphyxiation, which come upto the surface to respire, is a well known principle and a routine practice. Different vegetable & petroleum oil were tried for developing spreadable and continuous film forming water-in-oil emulsions in combination with different surfactants in order to find out the comparative effectiveness of these emulsions with a view to eradicating predatory aquatic insects in fish nursery, rearing and stocking ponds.

Different Methods must be employed to control aquatic insects (Pakarasi 1953, Konar 1964, Shirgur et al 1967 and Chatterji 1970) work on eradication of predatory air breathing aquatic insects, particularly from fish nurseries, has been

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lacking. Application of oils or their emulsions for eradication of aquatic insects in fish nurseries, (Meehean 1937) recommended the use of 1 part of cod liver oil to 3 part of kerosene. Pakrasi (1953) tried the emulsions of soap and vegetable oils in the proportion of 1 to 3 parts by weight.

Fresh part of each plant should be cut separately into small pieces and washed with sterilized water, (net weight 500 gm). The volatile fractions (essential oils) were isolated by hydrodistillation by Clevenger's apparatus showed two distinct layers an upper oily layer and the lower aqueous layer. Both the layers were separated and the essential oils were stored in clean glass viols after removing water traces with the help of capillary tubes and anhydrous sodium sulphate. Vegetable oils used were ground nut, mustard, linseed and castor. The essential oil used to control the predatory insects was *Chenopodium ambrosioides, Trachyspermum ammi* and *Derris indica.*

Predatory aquatic insects, fry and fingerlings of cultivable fish species were collected from fish hatcheries and farms.

Laboratory experiments were conducted in rectangular aquaria each measuring 6" x 7" x 8" to find out survival periods of both insects and fish fry and fingerlings, under the treatment of light speed diesel, kerosene oil and four vegetable oils, at a time along with lubricant S.A.E. (40).

Five specimens of each of the insect species and fish fry and fingerlings, comprising a set, were introduced in each of these aquariums, in which water surface was covered with the required barrier. The survival periods of individual specimens in each set were recorded.

The predatory aquatic insects which were identified and selected for this experiment are belonging to the orders coleopteran and Heteroptera and represented by species – *Cybister tripuntatus* (adults & larvae), *C. Congnatus, C. Suggillatus* (Coleoptera), *Anisops barbata, Sphaerodema rusticum, Ranatra elongatea* and *Laccotrephes* (Heteroptera).

RESULTS & DISCUSSION

With glass sheet across air-water interface, survival periods of the insects were in the range of 60-140 minutes (except Anisops barbata which survived only for 15 minutes). The details are given in Table 1.

Under similar conditions of barriers, glass sheet or different oil layers across air/water interface variations observed in the survival periods of the insects. Thus *Anisops barbata* seemed to be the least tolerant of all the insects and it would be the first to be eradicated in the treatment of fish nurseries.

Under the layers of 8 different oils, variable survival periods were observed *Anisops barbata*, under all these layers, survived the least period (9-12 minutes only). Under kerosene layers, all the insects survived for 9-45 minutes, indicating that this is the most toxic of all the oils. The survival period of these insects under each of the seven remaining oils, it is seen that the ground nut oil is next to kerosene in toxicity followed by castor, Esso-spiay oil 'B', light diesel, lubricant SAE 40, linseed and mustard oil in the order of their toxicity.

Similar experiments conducted on fish fry and fingerlings to find out comparative survival periods up to the maximum of seven days, showed that no mortality occurred with petroleum oil layers across air/water interface within this period of observation, whereas with ground nut, castor, mustard and linseed oils (Table 2).

The oil extracts of all the three plants showed positive results. Death of insects was observed in all the cases. The oil extracts were found to be detrimental to all members of the order Coleopteran, Hemiptera and Odonata of class Insecta.

***Chenopodium ambrosioides* Linn**

This plant belonging to family Chenopodiacea. It is a wild, annual aromatic herb upto 1.5 meter in height. It is also known as Mexican tea and American worm seed plant grows all over India in moist places. It is widely found in Bengal, U.P., Uttranchal, Assam and some states from south India. It is native of tropical America & West Indies.

The plant is of great medicinal value. The leaves and seeds have been a house hold remedy against intestinal worms since long leaf constituents are useful in influenza, pneumonia and typhoid.

***Trachyspermum ammi* L**

This plant belonging to family Apiaceae. It is an annual, aromatic herb. Different names is – Ajwain, Bishop's weed (English), Jowan (Bengali), Yawan (Gujrati), Omum (Malayalam,

Tamil), Vana (Telugu) Joniguti (Assamese), Ajmoda Yavmika (Sanskrit). It is found in U.P. Bihar, M.P. Punjab, Rajasthan, West Bengol, Tamilnadu, A.P., Dry area of central and western Asia such as Iraq, Iran, Afghanistan.

The plant is of great medicinal value. Oil of Ajwain is used in surgery as an antiseptic. The leaves of ajwain are used as a vermicide.

Derris indica

It is a plant of family leguminaceae which is an erect and perennial tree. These are usually found in regions of Southeast Asia and South West Pacific islands, including New Guinea. The tree is frequently found in pastures, waste lands, cultivated lands, road sides, lawns and in planted forests.

The plant is used for the treatment of many diseases such as the fruits and sprouts are used in folk remedies for abdominal tumors in India. In India seed were used for skin ailments. The juice of leaf is used for cold, cough, diarrhea, dyspepsia, flatulence & leprosy. Its roots contain rotenone, a strong insecticide. Derris root, when crushed, releases rotenone.

In Hemipter, families Notonectidae (back swimmers), Belostornalidae (giant water bugs) and family Nepidae (water scorpions) cause a heavy loss of carp spawn. Back swimmers are known to attack carp spawn, small fish, tadpoles and even small frongs (Distant, 1960). Water bugs are highly predaceous and feed on frogs & fishes. The serete a toxic salivary substance which kills the prey in a very short time. Water scorpion, attacks advanced carp fry and feeds on them.

In Coleoptera, families Dytiscidae, Hydrophilidae and Gyrinidae prey upon fish spawn. Dytiscidae (predaceous divine beeltes) are carnivorous both in adult and larval stages. They feed on all kinds of aquatic metazoans, the larger species commonly attacking small fish, tadpoles and dragonfly nymphs. (Pennak, 1953).

Among odonate-suborder – Anisoptera dragonfly nymphs are predatory and are observed to feed on carp spawn. These are multiplying rapidly between initial poisoning and stocking the pond. Many aquatic insects also fly from pond to pond. Thus a pond which has been affectively cleared of its insect population is soon repopulated with insects. For the survival of carp spawn, it is essential that the pond is cleared of its insect population immediately before stocking. Repeated seining of pond with a fine-meshed net before stocking does not eradicate the predatory insects. Effective control of insects is obtained viz insecticides. The more common insecticides, however, also affect adversely zooplankton and fish spawn, necessitating the use of only such selective poisons as are capable to kill insects but not the plankton and spawn (Chaudhuri, 1960).

Spraying oil to kill the insects, which came up to the surface to respire, is a well known principle and a routine practice in malaria control. A successful method for control of predatory insects to the applied 12 to 24 hours before stocking, developed at CIFRI's Cuttak substation, consists of spraying, on a still day, an emulsion of mustard or coconut oil and cheap washing soap is the ratio 56:18 Kg. per Ha (Pakrasi, 1953). The back swimmers are killed within half an hour. Higher does, however, kill water boatman beetle larvae and bugs. The substitution of soap by Teepol, B-300 (a detergent synthesized by Burmah shell) in the emulsion (Chatterjee. 1970). Teepol B-300 is a neutral amber coloured liquid radily soluble in water, unaffected by hard or brackish water and is easy to mix with oil. The recommended dose of Teepol is 560 ml, emulsified with 56 kg. mustard oil.

Table 1: Survival times (minutes) of different aquatic insects with glasssheet across air/water surface.

Coleopterans	Average period of survival	Heteropterans	Average period of survival
Cybister tripimelatus	60	*Anisops barbata*	12
C. Cognatus	118	*Sphaerodema ruslicuin*	55
C. Sugillatus	130	*Ranatra elongate*	67
C. tripunctatus Larva	140	*Laccotrephes rubber*	110

Table 2: Control of aquatic insects using essential oil

Name of Plants	Family	Essential oils isolated from plant parts	Death of insects
Chenopodium ambrosioides L	Cheropodiaceae	Leaf	Positive
Trachyspermum ammi L	Apiaceae	Seed	Positive
Derris indica	Fabaceae	Roots	Positive

CONCLUSION

The survival time of the Coleopterans, Heteropterans and Fish fry were compared when the petroleum oils like Kerosene, Esso spray oil, Light diesel and Lubricant SAE 40 was used for the removal of above insect class. The results shown that these Petroleum oils are also harmful for beneficial flora and fauna of the aquatic system and survival period of predators were not decreased very efficiently and there was no effect on fish fry.

When we use vegetable oils like Ground nut oil, castor oil, linseed oil and mustard oil were used for removal of predators, the results of Ground nut oil were very positive, specially for Coleopterans and Heteropterans, but these oils are very expansive to use for removal of harmful predators.

In present work we used *Chenopodium ambrosioides* L, *Trachyspermum ammi* L and *Derris indica* oil and the results showed that *Derris indica* is more effective for killing the predators and save the biodiversity of aquatic ecosystem.

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