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Short Communication

CITRULLUS COLOCYNTHIS (LINN.) AND *LUFFA ACUTANGULA* (L.) ROXB, SCHRAD. SOURCE OF BIOINSECTICIDES AND THEIR CONTRIBUTION IN MANAGING CLIMATE CHANGE

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ABSTRACT: In present agricultural practices greenhouse gases are created in a multitude of ways. Pesticide and fertilizer applications, irrigation, lighting, transportation, and other machinery are powered by greenhouse gas-emitting fossil fuels. The fertilizers and pesticides alone are one of the largest contributors to greenhouse gas emissions in agriculture. The overuse of agricultural chemicals pollutes watersheds and kills plants that could otherwise capture greenhouse gases and actually reduce global warming. Compared to conventional agriculture, organic agriculture is reported to be more efficient and effective both in reducing GHGs (CO_2, CH_4 and N_2O) emission mainly due to the less use of chemical fertilizers and pesticides. Organic agriculture also reported to be climate change resilience farming systems as it promotes the proper management of soil, water, biodiversity and local knowledge there by acting as a good options for adaptation to climate change. In the present study two of the cucurbits are studied for their insecticidal acitivity against Aphids one is a wild specie *Citrullus colocynthis* (Linn.) Schrad.and another one is cultivated specie that is *Luffa acutangula* (L.) Roxb., both have found effective but *C. colocynthis* found more effective than *L. Acutangula.*

Key words: *Citrullus colocynthis, Luffa acutangula,* bioinsecticides, climate change.

INTRODUCTION

Global climate change is considered one of the most urgent environmental problems. It is due to mainly negative impact of the emission of greenhouse gases (CO_2, CH_4, N_2O). Agriculture contributes to over 20 percent of global anthropogenic greenhouse gas emissions. In present agricultural practices greenhouse gases are created in a multitude of ways. Pesticide and fertilizer applications, irrigation, lighting, transportation, and other machinery are powered by greenhouse gas-emitting fossil fuels. The fertilizers and pesticides alone are one of the largest contributors to greenhouse gas emissions in agriculture. The overuse of agricultural chemicals pollutes watersheds and kills plants that could otherwise capture greenhouse gases and actually reduce global warming. Compared to conventional agriculture, organic agriculture is reported to be more efficient and effective both in reducing GHGs (CO_2, CH_4 and N_2O) emission mainly due to the less use of chemical fertilizers and pesticides. Organic agriculture also reported to be climate change resilience farming systems as it promotes the proper management of soil, water, biodiversity and local knowledge there by acting as a good options for adaptation to climate change. In organic agriculture instead of chemical based fertilizers and pesticides biofertilizers and biopesticides are used. Biofertilizers are Eco-friendly organic agro-input and more cost effective than chemical fertilizers. Biofertilizers like Rhizobium, Azotobacter, Azospirillum and blue green algae(BGA), Vesicular Arbuscular Mycorrhiza (VAM), Phosphate solubilizing microorganisms (PSM) and plant-growth promoting rhizobacteria (PGPR) are in use. It is environmentally friendly fertilizer that not only prevents damaging the natural source but helps to some extend clean the nature from precipitated chemical fertilizer. While Biopesticides are biochemical pesticides that are naturally occurring substances that control pests by non-toxic mechanisms. Biopesticides are certain natural plant products that belong to the so called secondary metabolites that include thousands of alkaloids, terpenoids, phenolics and minor secondary chemicals. Azadirachta indica is most commonly used for isolation of biopesticide and insecticides. Insecticides are important as many of the plant diseases occur due to insects one such insect is Aphid which transmit viral disease and cause great loss to agricultural crop.

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Aphid is one of the most common insect pests attacking a wide spectrum of economic plants, causing great loss in their yield. Chemical based insecticides give rise to GHGs therefore there is need for bioinsecticides. In the present study we chose a plant of desert which is not easily affected by insects and a cultivated plant of same species.
Citrullus colocynthis (L.) (*Cucurbitaceae*), commonly known as bitter apple, colocynth or wild gourd. *C. colocynthis* has gained increasing attention as a natural insecticide and its activity has been evaluated against many economically important insect species. *C. colocynthis* has deterrent, antifeedant, growth-regulating and fertility – reducing properties on insects (Prabuseenivasan, *et al*., 2004). Also, it is used as an abortifacient, cathartic, purgative and vermifuse, and for the treatment of fever, cancer, amenorrhea, jaundice, leukemia, rheumatism, tumour and as an insect repellant (Duke, 2006).
Luffa acutangula (L.) Roxb. Also belongs to the family Cucurbitaceae. It is commonly known as Kali tori in Hindi and ridge gourd in English. The crop is grown for their fruits. It has high contents of Ca, P, Oxalic acid, Vitamin A and C. Fruit is cathortic, expectorant, demulcent, diuretic and nutritive anthelmintic, stomachic, antipyretic (Dastur, 1964) and In jaundice. Seeds possess emetic and purgative properties. An emultion of the decorticated seed is valuable substitute for ipecacuanha in dysentry (Rajan and Balchandran, 1999). The leaf or its juice is used as a dressing for sores, haemorrhoids and leprosy, inflammed spleen, ringworm, piles and bites of insects and animals.

MATERIALS AND METHODS

Collection of plant materials

Plants of *Citrullus colocynthis* were collected from different localities identified by herbarium of Department of Botany, University of Rajasthan.

Preparation of Extracts: For ethanolic extraction, aerial parts of *Citrullus colocynthis* dried, powdered and plant material (50 gm) was extracted with 200 ml ethanol for 24 hrs. by using Soxhlet apparatus. The extracts were filtered and concentrated under vacuum sounding apparatus for 30 min. The extract was stored at 4°C.

Bioassay

Aphids were obtained from leaves of mustard and identified by Entomology laboratory, zoology department of University of Rajasthan. Identified as *Lipaphis erysimi* Kalt. Slid-dipping technique was used to evaluate the toxicity of the tested extracts against adult stage of *Lipaphis erysimi* Kalt.. Three concentrations of each extract were prepared i.e.100µg/ml, 250µg/ml and 500µg/ml of extract in distilled water, as control distilled water was taken. By means of fine brush, ten adults were affixed to double face scotch tap and stuck tightly to slide on the dorsal part. The slides were then dipped in the prepared solutions for ten seconds. Three replicates of ten adults were used for each concentration. Mortality was determined at an interval of 2, 4, 8, 24, 48 hrs by response of insects to touching with the fin brush.

RESULTS

Chemical based insecticides give rise to GHGs therefore there is need for bioinsecticides. From the results (Table 1) we can conclude that insecticidal activity by the application of *C. colocynthis* and *L. acutangula* extract at 250µg/ml and 500µg/ml concentration for 24hrs result in 100% mortality while at 100µg/ml concentration for 48 hrs result in 100% moortality. And *C. colocynthis* extract LT_{50} is 3.40 hrs at 500µg/ml which is less than *L. acutangula* extract LT_{50} 4hrs at same concentration it shows that *C. colocynthis* extract is more effective than *L. acutangula* extract (Fig.1&Fig.2).

Table 1: Effect of *C. colocynthis* and *L. acutangula* extracts concentrations on mortality of Mustard Aphids

Extracts	Concentrations	2hrs	4hrs	8hrs	24hrs	48 hrs	LT_{50}
Control		4	10	15	40	72	34hrs
C.colocynthis	100µg/ml	12	22	45	80	100	12hrs
	250µg/ml	24	36	68	100	100	6.10hrs
	500µg/ml	32	55	85	100	100	3.40hrs
L. acutangula	100µg/ml	10	20	42	70	100	14hrs
	250µg/ml	18	35	65	100	100	6hrs
	500µg/ml	30	48	78	100	100	4hrs

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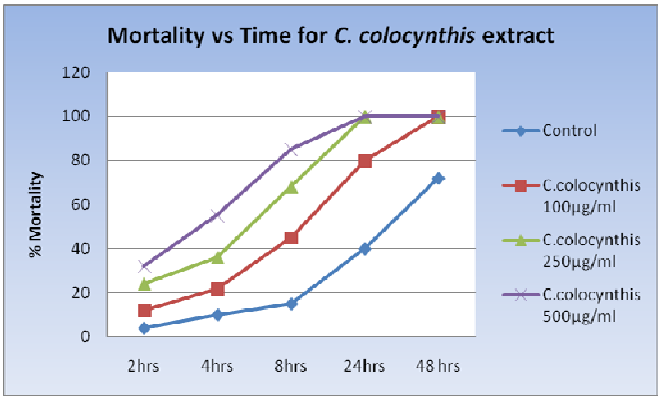

Fig. 1: Effect of different concentrations of *C. Colocynthis* extract on time required for 50% mortality (LT_{50})

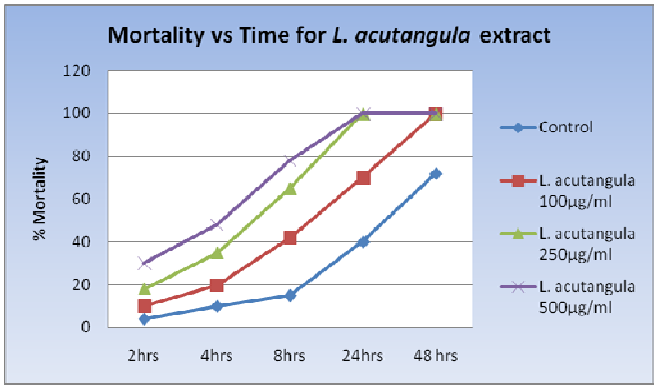

Fig. 2: Effect of different concentrations of *L. Acutangula* extract on time required for 50% mortality (LT_{50})

DISCUSSION

These plant extracts proved potential source of bioisecticides which can be helpful in replacing chemical insecticides and may be good remedy for global warming and climate changed. Although the objective set out for this research have been fulfilled the scale up studies are required to understand the mechanism(s) of extracts of Cucurbitaceae family on other insects of different food crops.

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