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Preliminary screening of some plants of Punjab, Pakistan for Phytochemicals

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ABSTRACT

Plants produce different metabolites and some of them are used for antimicrobial, fungicidal, herbicidal, piscicidal and molluscicidal. The present study was aimed to find out metabolites of piscicidal potential. Total thirty plants were collected on the basis of their availability and abundance around the year from different locations of Punjab, Pakistan. The aqueous and alcoholic extract of fresh and dried parts of each plant were used for qualitative estimation of thirteen metabolites (alkaloids, carbohydrate, cardiac glycoside, flavonoid, phenol, phlobatannine, free amino acids, saponins, tannins, terpenoids, quinine, oxalic acid and steroids). Twenty one plants showed the presence of phytochemicals. The use of piscicidal property of these plants may improve the production of aquaculture by getting rid of unwanted fish species.

Key Words: Alcoholic extract, Aqueous extract, Phytochemicals, Metabolites, Plants

INTRODUCTION

Pakistan supports a very rich flora in alluvial plains of the Himalaya (Nasir & Ali, 1970-89; Shinwari, 2010). Punjab (one of the provinces of Pakistan) is the land of five rivers and has all the four seasons for the seed germination and growth of plants. Different plants / weeds grow in different seasons of the years. Resultantly, different types of plants/ weeds are available throughout the year (Qureshi *et al*., 2009; Siddiqui *et al.,* 2009; Qureshi *et al*., 2010, 2011; Salehi *et al.,* 2011; Hamed *et al*., 2015). Each plant has its own peculiar qualities due to its physical as well as its chemical characteristics. These plants synthesize different bioactive chemicals (phytochemicals) which being the secondary metabolites are not required directly for the plant itself (Ayoola, 2006, 2008; Dastgir & Hussain, 2013). These secondary metabolites (phenol, tannin, saponin etc.) are synthesized in all parts of the plants. However, their quality and quantity may be different in different parts of a plant depending upon age of the plant, climatic conditions, soil of the area and biological activity of the particular part of the plant (Hill, 1952; Fransworth, 1966; Ha *et al.,* 2001; Hussain *et al.,* 2011; Khan *et al.,* 2011; Savithrama *et al.,* 2011; Ugochukwu *et al.,* 2013; Jayanth & Lalith, 2013 and 2014; Bharti & Bhushan, 2015; Zare *et al.,* 2015).

The parts of the plants due to the presence of secondary metabolities are sometime used directly for antibacterial, fungicidal, herbicidal, molluscicidal and piscicidal purposes but mostly metabolites (phytochemicals) are used after extraction and purification. The quality of metabolites can be further improved by adding/subtracting certain chemicals (Fansworth *et. al.*, 1966; Everiest, 1974, 1981; Das *et al.,* 2010; Hussain *et al.,* 2011; Kumar *et al.,* 2014). Quality of each phytochemical (alkaloids, tannins, favonoid, glycosides, terpenoids and phenolic compounds) depends upon the method and nature of the solvent used for their extraction (Harbone, 1973; Zahid *et al.,* 2002; Zhang and Guo, 2005, 2006; Sharma & Kumar, 2008; Mirjalili *et al.,* 2009; Das *et al.,* 2010; Savithramma *et al.,* 2011; Tiwari *et al.,* 2011; Litha & Jayanthi, 2012; Sardhara & Gopal, 2013; Kumar *et al.,* 2014; Mungenge *et al.,* 2014; Mariappan *et al.,* 2015; Sogbesan & Emmanuel, 2015; Pushpa *et al.,* 2015; Greenshina & Murugan, 2016; Tasneem *et al.,* 2016). The present study was aimed to find out the presence of different phytochemicals both in fresh and dried parts of locally available plants which may be used as antibacterial, fungicidal, herbicidal, molluscicidal and piscicidal agents.

MATERIALS AND METHODS

Collection and identification of plants

Thirty plants were collected from the different localities of Punjab, Pakistan (Table 1) and immediately transported to laboratory. The identification of plants were confirmed following the identification keys (Nasir & Ali, 1970-89; Shinwari, 2010).

Author's Contribution: S.Z.A.A., H.A.S., Experimental work & data analysis; **S.S.A., J.I.Q.,** Manuscript writing & finalization

Table I: Description of plants collected from different localities

Sr. No	Scientific Name	Lab. code	Local name	Family	Order	Collection Area	Distribution, seasons and economic value
1.	*Achyranthus aspera*	ZAA-089	-	Amaranthaceae	Caryophyliales	Islamabad	Locally available weed throughout Pakistan in winter with no economic value
2.	*Anamirta cocculus (Seeds)*	ZAA-102	Magar Mahi	Menispermaceae	Ranunculales	Local market	Imported from India. Seeds available in all seasons and have moderate economic value
3.	*Calendula arvensis*	ZAA-103	-	Asteraceae	Asterales	Islamabad	Locally available weed throughout Pakistan in winter with no economic value
4.	*Calotropis procera*	ZAA-104	Ak	Asciepiadaceae	Gentianales	Lahore, Faisalabad	Locally available weed throughout Pakistan in all seasons with no economic value
5.	*Carthamus Oxyacantha*	ZAA-105		Asteraceae	Asterales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
6.	*Chenopodium ambrosioides*	ZAA-106	Wild bathu	Amaranthaceae	Caryphyliales	Islamabad, Lahore	Locally available weed in winter throughout Pakistan with no economic value
7.	*Cichorium intybus*	ZAA-107		Asteraceae	Asterales	Islamabad	Locally available weed in winter only in hilly areas of Pakistan with no economic value
8.	*Colocasia esculenta*	ZAA-108	Elephant ear	Araceae	Alismatales	Faisalabad Islamabad	Ornamental Plant Found throughout Pakistan in all seasons with moderate economic value
9.	*Conyza canadensic*	ZAA-109		Asteraceae	Asterales	Islamabad	Locally available weed in winter only in hilly areas of Pakistan with no economic value
10.	*Coronopus didymus*	ZAA-110		Brassicaceae	Brassicales	Islamabad	Locally available weed in winter only in hilly areas

							of Pakistan with no economic value
11.	*Crozophore tinctora*	ZAA-111		Euphorbiaceae	Malipighiales	Islamabad	Locally available weed in winter only in hilly areas of Pakistan with no economic value
12.	*Datura alba*	ZAA-112		Solanaceae	Solanales	Lahore, Islamabad	Locally available weed in all seasons throughout Pakistan with no economic value
13.	*Echinops echinatus*	ZAA-113		Asteraceae	Asterales	Islamabad	Locally available weed in winter only in hilly areas of Pakistan with no economic value
14.	*Euphorbia heliscopia*	ZAA-114		Euphorbiaceae	Malipighiales	Islamabad	Locally available weed in winter only in hilly areas of Pakistan with no economic value
15.	*Lactuca dissecta*	ZAA-115		Asteraceae	Asterales	Islamabad	Locally available weed in winter only in hilly areas of Pakistan with no economic value
16.	*Lantana indica*	ZAA-116		Verbenaceae	Lamiales	Lahore, Faisalabad	Locally available weed in all seasons throughout Pakistan
17.	*Malia azedarach*	ZAA-117	Derhaik	Meliaceae	Sapindales	Lahore, Faisalabad	Locally available plant throughout Pakistan in all seasons with no economic value
18.	*Malvestrum coromandelia nnum*	ZAA-118		Malvaceae	Malvales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
19.	*Nerium oleander*	ZAA-119	Kanair	Apocynaceae	Gentianales	Faisalabad, Islamabad	Locally available ornamental plant almost everywhere in Pakistan in all seasons with moderate economic value
20.	*Physalis peruviana*	ZAA-120		Solanaceae	Solanales	Islamabad	Locally available weed in winter in

							hilly areas of Pakistan with no economic value
21.	*Ricinus communis*	ZAA-121	Arind, Hernoli	Euphorbiaceae	Malpighiales	Lahore, Faisalabad	Locally available plant in all seasons throughout Pakistan with moderate economic value
22.	*Rumex dentatus*	ZAA-122		Polygonaceae	Caryophyliales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
23.	*Salvia moorcroftina*	ZAA-131	Wild Tobaco	Lamiaceae	Lamiales	Islamabad	Locally rarely available weed in winter in hilly areas of Pakistan with no economic value
24.	*Sapium sebifers*	ZAA-134		Euphorbiaceae	Malpighiales	Lahore, Islamabad	Locally available ornamental plant in all seasons throughout Pakistan with moderate economic value
25.	*Sassuria heteromalia*	ZAA-154		Asteraceae	Asterales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
26.	*Silybum marianum*	ZAA-161		Asteraceae	Asterales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
27.	*Trichodesma indicum*	ZAA-162		Boranginaceae	Unplaced	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
28.	*Trifolium repens*	ZAA-166		Fabaceae	Fabales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
29.	*Verbena tenuisecta*	ZAA-172		Verbenaceae	Lamiales	Islamabad	Locally available weed in winter in hilly areas of Pakistan with no economic value
30.	*Withania somnifera*	ZAA-178		Solanaceae	Solanales	Lahore, Faisalabad, Islamabad	Locally available weed in winter throughout Pakistan with no economic value

Preparation of Extracts

Different parts of every plant (roots, stem, leaves, and flowers) were divided into two portions. One portion was proceeded as fresh and second part of every plant was dried at room temperature and then grinded into fine powder by electric grinder (OSAKA, China) at speed of 500 rpm separately. The fine powder (50 g) of each portion was suspended in different extraction medium (water or ethanol) in a ratio of 1:2 w/v at room temperature for 24 h. The fluid was then filtered by using cheese cloth in reagent bottle and then Whatmann filter paper No. 1. The aqueous and alcoholic extracts of fresh and dried parts of each plant were kept at room temperature in air tight vials.

Phytochemical screening of aqueous and ethanolic extracts

Standard procedures as described by Ugochukwu *et al.* (2013), and Nandagoapalan *et al.* (2016) were used to evaluate the presence of different categories of phytochemicals in each plant extract. Following is a brief description of the standard procedures. All the experiments were performed in triplicate.

Total alkaloids (Wagner's reagent)

Each extract (2 ml) was taken in a test tube and mixed with 3-5 drops of Wagner's reagent (2g of iodine and 6g of KI in 100ml of water). The control was treated similarly after adding water instead of plant extract. Formation of reddish brown precipitate or coloration as compared to control was considered positive for the presence of alkaloids (Pershant *et al.,* 2011).

Total carbohydrate (Molisch'reagent)

Two ml of an extract was mixed with two ml of water in a test tube labeled as sample. Whereas control contained 4ml water and then few drops of Molisch's reagent (5% α-napthol in absolute alcohol) were added in each test tube followed by addition of 2 ml of Conc. H_2SO_4 carefully. After 2-3 minutes, formation of red or dull violet color in comparison with control at the mixing point of two layers indicated the presence of carbohydrates (Pershant *et al.,* 2011).

Flavonoids (Alkaline reagent test)

Each extract (2 ml) was mixed with 2-3 drops of 20 % NaOH solution. Two ml of water served as control. Formation of dense yellow color which became colorless by mixing with few drops of dilute HCl indicated the presence of flavonoid in the extract (Preshant *et al.,* 2011).

Phenols (Ferric Chloride test)

Two ml of each extract was mixed with 3-4 drops of 5% ferric chloride solution. Dark blue color or black color formation in the test tube was indication for the presence of phenols in the extract (Harborne *et al.,* 1973; Tyler & Herbalgram,1994).

Salkowki's test for terpenoides

Each extract (2 ml) was mixed with 1 ml of chloroform in test tube followed by the addition of 3-4 drops of conc. H_2SO_4. Formation of reddish brown precipitate was considered positive for the presence of terpenoids in the extract (Ayoola *et al.,* 2008; Pershant *et al.,* 2011).

Foam test for saponins

Two ml of extract was diluted with 6ml of water. Formation of relentless foam confirmed the presence of saponins in the extract (Harborne *et al.,* 1973).

Braymer's test for tannins

Two ml of each extract was mixed with the 1-2 drops of 10% ethanolic ferric chloride solution. Creation of blue to greenish color showed the presence of tannins in the extract (Harborne *et al* 1973).

Keller kalian's test for cardiac glycosides

Five ml of each extract was mixed with 2ml of glacial acetic acid followed by the addition of 1-2 drops of 5% ferric chloride. Thereafter, 1 ml of Conc. H_2SO_4 was added in the bottom of test tube carefully. Formation of brown ring at the mixing point was considered positive for the presence of de-oxy-sugar; distinctiveness of cardenolides (Ayoola *et al.,* 2008).

Test for quinones

One ml of each extract was mixed with few drops of conc. HCl. Formation of yellow precipitate indicated the presence of quinines in the extract (Pershant *et al.,* 2011).

Test for oxalate

Few drops of glacial ethanolic acid were added in the 3ml of extract in a test tube. Formation of greenish black color was considered positive for the presence of oxalate in the extract (Pershant *et al.,* 2011).

Test for phlobatannins (Precipitate test)

Two ml of each extract was boiled in a test tube with 1ml of 1% aqueous HCl. Formation of red precipitate was considered positive for the presence of phlobatannine in the extract (Pershant *et al.,* 2011).

Ninhydrin test for amino acids and proteins

A few (2-3) drops of ninhydrin solution (made in 1% acetone) were added to 2 ml of an extract and the mixture boiled in water bath for 1-2 minutes. Formation of purple color was considered positive for the presence of amino acid and protein in the extracts (Pershant *et al.,* 2011).

Liebermann-burchard test for steroids

One ml of each extract mixed with few drops of chloroform, acetic anhydride and Conc.

H_2SO_4. Precipitate of dark pink or red color indicated the presence of sterols (Pershant *et al.,* 2011).

RESULTS AND DISCUSSION

In present study, 13 phytochemicals in different parts (fresh and dried) of thirty plants were studied after preparing aqueous as well as ethanolic extract. Twenty one plants showed positive results for the presence of phytochemicals. While 9 plants showed complete absence of these phytochemicals. When the %age distribution of the phytochemicals were worked out for the twenty one plants species investigated it was revealed that most of the phytochemicals were extracted in equal percentage from both fresh and dried forms except in case of alkaloids and terpenoids which were in fresh and dried leaves were: 56 and 63, 56 and 59 %, respectively .Same was the position for terpenoids in fresh stem as 57% and in dried stem it was 62%. It was also observed that leaves were better part of plants to extract the phytochemicals (19 to78%) as compared to stem (14 to 76%) and roots (14 to 71%). Similar finding was reported by other researchers (Offer & Uchenwoke, 2015; Zaman *et al.,* 2016)

It was also observed that ethanol was better extractor than aqueous medium. The present study was in line with other findings (Yadav *et al.,* 2014; Jardat *et al.,* 2015). In aqueous medium, alkaloid, cardiac glycosides, phenol, terpenoid quinine, oxalic acid and steroid from leaves were extracted in 56, 59, 67, 56, 41, 22 and 63%, respectively. Whereas in ethanol their quantities were 74, 63, 81, 74, 52, 37 and 78%, respectively (Table II-III).

Table II: Percent of presence of different phytochemicals in aqueous extracts of fresh (F) and dried (D) parts of plants

Phytochemicals	Aqueous Extract																	
	Leaves (n=27)		Stem (n=21)		Roots (n=14)		Flowers (n=8)		Fruits (n=5)		Seeds (n=3)		Thornes (n=2)		Latex (n=1)		Whole plant (n=2)	
	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D
Alkaloids	56	63	33	33	36	36	63	63	100	100	100	100	50	50	100	100	100	100
Carbohydrate	78	78	76	76	71	71	100	100	100	100	100	100	50	50	100	100	100	100
Cardiac glycoside	59	56	71	71	64	64	100	100	80	80	100	100	50	50	100	100	50	50
Flavonoid	41	41	33	33	43	43	25	25	80	80	67	67	100	100	100	100	0	0
Phenol	67	63	71	71	71	71	50	50	100	100	100	100	50	50	100	100	50	50
Phlobatannine	19	19	14	14	14	14	13	13	20	20	0	0	0	0	0	0	0	0
Amino acids	19	19	24	24	36	36	13	13	60	60	33	33	0	0	100	100	50	50
Saponins	74	74	71	71	71	71	88	88	80	80	67	67	100	100	0	0	100	100
Tannins	74	74	71	71	71	71	50	50	100	100	67	67	100	100	100	100	0	0
Terpenoids	56	59	57	62	64	64	50	50	80	80	100	100	50	50	100	100	0	0
Quinine	41	44	38	38	57	57	25	25	80	80	100	100	50	50	100	100	50	50
Oxalic acid	22	22	29	29	29	29	13	13	80	80	67	67	0	0	100	100	0	0
Steroids	63	63	71	71	79	79	38	38	80	80	100	100	50	50	100	100	100	100

Table III: Percent of presence of different phytochemicals in alcoholic extracts of fresh (F) and dried (D) parts of plants

Phytochemicals	Alcoholic Extract																	
	Leaves (n=27)		Stem (n=21)		Roots (n=14)		Flowers (n=8)		Fruits (n=5)		Seeds (n=3)		Thornes (n=2)		Latex (n=1)		Whole plant (n=2)	
	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D
Alkaloids	74	74	33	33	50	50	88	88	80	80	100	100	100	100	100	100	100	100
Carbohydrate	78	78	81	81	71	71	100	100	100	100	100	100	50	50	100	100	100	100
Cardiac glycoside	63	63	71	71	57	57	100	100	100	100	100	100	50	50	100	100	50	50
Flavonoid	44	44	33	33	43	43	38	38	80	80	67	67	100	100	100	100	0	0
Phenol	81	81	81	81	79	79	63	63	100	100	100	100	50	50	100	100	50	50
Phlobatannine	19	19	14	14	21	21	13	13	20	20	0	0	0	0	0	0	0	0
Amino acids	19	19	24	24	43	43	13	13	60	60	0	33	50	50	100	100	50	50
Saponins	74	74	76	76	64	64	88	88	80	80	67	67	100	100	0	0	100	100
Tannins	78	78	76	71	71	71	63	63	100	100	67	67	100	100	100	100	0	0
Terpenoids	74	74	86	86	93	93	38	38	100	100	100	100	100	100	100	100	0	0
Quinine	52	52	43	43	71	71	25	25	100	100	100	100	50	50	100	100	50	50
Oxalic acid	37	33	29	29	29	29	13	13	100	100	100	100	100	100	100	100	0	0
Steroids	78	78	86	86	79	79	88	88	100	100	100	100	50	50	100	100	100	100

In the present study, the cardiac glycosides, phenol, saponins, tannin and sterol were present in aqueous extract of stem of white flowered *Narium oliender*. Both extracts of leaves of white flowered *N. oliender* showed the presence of alkaloids, carbohydrates, cardiac glycosides, phenol, saponins, tannin and sterol, Aqueous extract of leave from red flowered *N. oliender* plant showed presence of terpenoids in addition to the other chemicals present in white flowered of *N. oliender.* Aqueous extract of white flowers *N. oliender* showed the presence of carbohydrate, phenol, saponins, tannin and steroids whereas ethanolic extract of white flowers *N. oliender* also contained

oxalic acid (Table IV). Aqueous extract of the seeds of *Melia azedarach* showed presence of alkaloids, carbohydrate, cardiac glycoside, amino acid, terpenoids, quinine, and sterol, whereas in ethanolic extract of *M. azedarach,* amino acids were absent. Both categories of the extracts of leaves of *M. azedarach* showed the presence of alkaloids, carbohydrate, phenol, tannin, terpenoids, quinine and oxalic acid. Aqueous extract of stem of *M. azedarach* showed the presence of carbohydrate, cardiac glycoside, and saponins, whereas ethanolic extract of stem of *M. azedarach* also expressed the presence of terpenoids in addition to the chemicals recognized in aqueous extract (Table IV.).

Both aqueous as well as ethanolic extracts of roots of *Salvia moorcroftina* showed the presence of alkaloid, carbohydrate, phenol, saponins, tannin, quinines and steroids, whereas the latter category of the extract of *S. moorcroftina* also showed the presence of terpenoids. Aqueous leave extract of *S. moorcroftina* showed the presence of alkaloid, phenol, phlobatannine, tannin, terpenoids, saponins, quinines, and steroids, whereas ethanolic extract of *S. moorcroftina* showed the presence of same chemicals except saponins. Both types of extracts of stem of *S. moorcroftina* showed the presence of alkaloids, phenol, phlobatannine, saponins, tannin, terpenoids, quinines and steroids. (Table IV). Aqueous extract of the leaves of *Datura alba* showed the presence of carbohydrate, cardiac glycosides, saponins, and tannin, whereas ethanolic extract of *D. alba* showed the presence of, phenol, terpenoids, quinines and sterol in addition to the chemicals recognized in aqueous extract of *D. alba*. Aqueous extract of root of *D. alba* showed the presence of carbohydrate, cardiac glycosides and saponins whereas ethanolic extract of *D. alba* showed the presence of tannin, terpenoids and sterol in addition to the chemicals recognized in aqueous extract of *D. alba*. However, cardiac glycosides were absent in ethanolic extract of the root. Aqueous extract of stem of *D. alba* showed the presence of carbohydrate, cardiac glycosides and saponins, whereas ethanolic extract of *D. alba* also showed the presence of quinines and steroids (Table IV).

Aqueous extract of the roots of *Withania somnifera* showed the presence of carbohydrate, amino acid, saponins and sterol whereas the ethanolic extract of roots of *W. somnifera* also showed the presence of phlobatannine and terpenoids. However, amino acids were absent in the ethanolic extract of *W. somnifera*. Aqueous extract of the dried stem of *W. somnifera* showed the presence of carbohydrate, saponins, tannin and steroids whereas ethanolic extract of *W. somnifera* also showed the presence of terpenoids. However, tannins were absent in ethanolic extract of *W. somnifera*. Both categories of the extracts of fresh stem *W. somnifera* showed the presence of carbohydrate, cardiac glycosides, saponins, tannin and steroids. Aqueous extract of both fresh and dried leaves of *W. somnifera* showed the presence of carbohydrate, saponins tannin and steroids whereas in aqueous dried leaves extract of *W. somnifera* cardiac glycosides and phenol were absent. Ethanolic extract of both fresh and dried leaves of *W. somnifera* showed the presence of carbohydrate, cardiac glycosides, phenol, saponins, tannin, terpenoids and steroids (Table IV). Aqueous extracts of fresh and dried leaves of *Cryzophore tinctora* showed the presence of phenol, saponins, tannin and steroids, whereas ethanolic extract also showed terpenoids. Aqueous extract of dried leaves of *C. tinctora* also showed the presence of quinine and absence of phenol. Both aqueous as well as ethanolic extracts of fresh and dried stem of *C. tinctora* showed the presence of phenol, saponins, tannin, quinine, terpenoids and steroids. Both aqueous as well as ethanolic extracts of fresh and dried roots of *C. tinctora* showed the presence of phenol, saponins, tannin, quinine, terpenoids and steroids (Table IV).

Both aqueous as well as ethanolic extracts of leaves, stem and roots of *Chenopodium ambrosioides* showed the presence of cardiac glycosides, saponins and steroids whereas ethanolic extract of stem and roots of *C. ambrosioides* also showed the presence of terpenoids (Table IV). Both aqueous as well as ethanolic extracts of the flowers and stems of *Carthamus oxyacantha* showed the presence of carbohydrate, cardiac glycosides, saponins, tannin, and terpenoids, whereas ethanolic extract of the flowers and stem of *C. oxyacantha* also showed alkaloids, phenol, and steroids. Both Aqueous as well as ethanolic extracts of roots of *C. oxyacantha* showed the presence of carbohydrate, cardiac glycosides, saponins, tannin, and terpenoids whereas ethanolic extract of roots of *C. oxyacantha* also showed alkaloids, phenol, and steroids (Table IV). Aqueous extracts of the stem of *Conyza canadensic* showed the presence of alkaloid and carbohydrate whereas the ethanolic extract of *C. canadensic* also showed the presence of saponins. Aqueous extract of the leaves of *C. canadensic* showed the presence of carbohydrate, phenol, saponins and tannin, whereas the ethanolic extract of the leaves of *C. canadensic* also showed the presence of alkaloids, terpenoids and quinines. Both categories of the extracts of the flowers of *C. canadensic* showed the presence of alkaloids,

carbohydrate, cardiac glycosides acid, flavonoid, phenol, tannin, terpenoids and quinines. Aqueous extract of the roots of *C. canadensic* showed the presence of carbohydrate phenol, amino acid saponins and tannins whereas the ethanolic extract of roots of *C. canadensic* also showed the presence of phenol, quinines and terpenoids (Table IV).

Aqueous extracts of the stem and leaves of *Trichodesma indicum* showed the presence of flavonoid, phenol and tannin whereas aqueous extract of leaves of *T. indicum* also showed the presence of terpenoids. Ethanolic extracts of the stem and leaves of *T. indicum* showed the presence of flavonoid and quinines, whereas ethanolic extract of the stem of *T. indicum* also showed phenol and tannin but the extract of leaves of *T. indicum* showed alkaloids. Both aqueous as well as ethanolic extract of the roots of *T. indicum* showed the presence of alkaloid, flavonoid, phenol, tannin, terpenoids and quinine (Table IV). Both aqueous as well as ethanolic extracts of the stem of *Lantana indica* showed the presence of carbohydrate, cardiac glycosides, amino acid, saponins, terpenoids and sterol. Aqueous extract of the flowers and leaves of *L. indica* showed the presence of alkaloids, carbohydrate, cardiac glycosides, phenol, saponins and sterol, whereas the ethanolic extracts of flowers and leaves of *L. indica* also showed the presence of, flavonoid and tannin. Aqueous extract of the roots of *L. indica* showed the presence of carbohydrates, cardiac glycoside, phenol, saponins, and steroids whereas the ethanolic extract of the roots of *L. indica* also showed the presence of alkaloids, amino acids, terpenoids and quinines (Table IV).

Aqueous extract of the stem of *Lactuca dissecta* showed the presence of carbohydrate, cardiac glycosides, phenol, saponins, tannin and sterol, whereas the ethanolic extract of *L. dissecta* also showed the presence of terpenoids Aqueous extract of the leaves of *L. dissecta* showed the presence of alkaloid, carbohydrate, flavonoid, phenol, saponins, tannin, quinines and sterol, whereas the ethanolic extract of *L. dissecta* also showed the presence of cardiac glycosides and terpenoids. Aqueous extract of the root of *L. dissecta* showed the presence of carbohydrate, cardiac glycosides, flavonoid, and sterol, whereas sterol was absent in ethanolic extract of *L. dissecta* (Table IV). Both aqueous as well as ethanolic extracts of the stem *Achyranthus aspera* showed the presence of carbohydrate, phenol and sterol. Both aqueous as well as ethanolic extracts of thorns of *A. aspera* showed the presence of alkaloid, carbohydrate, cardiac glycosides, flavonoid, phenol, saponins, tannin, terpenoids and sterol. Both aqueous as well as ethanolic extracts of the leaves of *A. aspera* showed the presence of phenol, saponins, tannin, terpenoids and sterol. Both aqueous as well as ethanolic extracts of the roots of *A. aspera* showed the presence of phenol, saponins, tannin, terpenoids and sterol (Table IV).

Both aqueous as well as ethanolic extracts of the stem of *Malvestrum coromadnalninum* showed the presence of carbohydrate, phenol, saponins, tannin and terpenoids. Both aqueous as well as ethanolic extract of the root of *M. coromadnalninum* showed the presence of alkaloids, carbohydrate and saponins (Table IV).

Both aqueous as well as ethanolic extracts of the leaves of *Silybum marinumte* showed the presence of carbohydrate, phenol, saponins, tannin, terpenoids and steroids. Both aqueous as well as ethanolic extract of the roots of *S. marinumte* showed the presence of saponins, quinines and steroids (Table IV). Aqueous extract of the leaves of *Coronopus didymus* showed the presence of carbohydrate, phenol, amino acid, saponins, and tannin, whereas ethanolic extract of *C. didymus* also showed the presence of terpenoids and steroid (Table IV). Aqueous extract of the leaves of *Calotropis procera* showed the presence of alkaloids, carbohydrate, cardiac glycosides, flavonoid, phenol, amino acid, tannin, terpenoids, quinines and steroids, whereas ethanolic extract of *C. procera* also showed oxalic acid. Aqueous extract of the stem showed the presence of carbohydrate, cardiac glycosides, phenol, amino acid and sterol, whereas ethanolic extract of *C. procera* also showed tannin. Aqueous extract of the fruits of *C. procera* showed the presence of alkaloids, carbohydrate, cardiac glycosides, flavonoid, phenols, amino acid, tannin, terpenoids, quinine, and sterols, whereas the ethanolic extract of *C. procera* also showed the presence of oxalic acid. Both categories of extracts of the latex showed the presence of alkaloids, carbohydrate, cardiac glycosides, flavonoid, phenols, amino acid, tannin, terpenoids, quinine, oxalic acid, and sterols. Both categories of extracts of the roots of *C. procera* showed the presence of alkaloids, carbohydrate, cardiac glycosides, flavonoid, phenols, amino acid, tannin, terpenoids, quinine, oxalic acid, and sterols (Table IV).

Both aqueous as well as ethanolic extracts of the leaves of *Colocasia esculenta* showed the presence of carbohydrate, cardiac glycosides, flavonoid, phenol, tannin and sterol whereas ethanolic extract of *C. esculenta* also showed terpenoids, quinines and oxalic acid. Both categories of extracts of the stems of *C. esculenta* showed the presence of carbohydrate, cardiac

glycosides, flavonoid, phenol, tannin, terpenoids, quinines, oxalic acid and sterol (Table IV). Both aqueous as well as ethanolic extracts of the whole plant of *Echinops echinatus* showed the presence of carbohydrate, phenol amino acid and saponins, whereas the ethanolic extracts of *E. echinatus* also showed quinines and sterol (Table IV). Aqueous extract of the whole plant of *Sassuria heteromalia* showed the presence of alkaloids, carbohydrate, cardiac glycosides and saponins whereas ethanolic extract of *S. heteromalia* also showed sterol (Table IV). Aqueous extract of the leaves of *Sapium sebifers* showed the presence of carbohydrates, cardiac glycosides, saponins and sterol whereas ethanolic extract of *S. sebifers* also showed phenol, tannins, oxalic acid and alkaloids (Table IV). The present study agreed with reported results on similar plants for instance. Zahid *et al.* (2002) extracted flavonoid, glycosides from *S. moorcroftina*. *E. helioscopia* had been reported to possess tannin, saponins, diterpenoids, and amino acids (Ha *et al.,* 2001; Zhang & Guo, 2005, 2006; Zhang *et al.,* 2005; 2006). *Achyranthus aspera* contains triterpenoid and saponins. Mirjalili *et al.,* (2009) extracted steroidal lactones from *Withania somnifera*. Muller *et al.* (1968) declared the presence of amino acids in latex of *Euphorbia helioscopia.* Yamamura *et al.* (1989) reported extraction of diterpenes from *Euphorbia helioscopia. Sapium sabiferum* contains diterepene esters (Everist, 1981). Nature of the phytochemicals reported in the present study advocate for their fungicidal, bactericidal, piscicidal and molluscicidal potential; as the phytochemicals have been demonstrated for such activities (Mungenge *et al.,* 2014).

Table IV: Phytochemicals detected in aqueous (A) and ethanolic (B), fresh/ dried parts of the plants

Name of plant	Part	Alk		Carb.		Card. Gly		Flav.		Phe.		Phlob.		Am. Acid		Sap.		Tan.		Ter.		Quin		Oxal		Ster.	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Nerium oleander	Flower (White)	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+
	Flower (Pink)	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+	+/+
	Stem (White)	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Stem (Pink)	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Leaves (White)	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/_
	Leaves (Pink)	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-
Melia azedarach	Seeds	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	-/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+
	Leaves	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-
	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	-/-	-/-
Salvia moorcroftina	Roots	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	+/+	+/+	+/+	-/-	-/-	+/+	+/+
	Leaves	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	+/+	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+
	Stem	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+
Datura alba	Leaves	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	+/+	-/-	+/+	-/-	-/-	-/-	+/+
	Roots	-/-	-/-	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	+/+	-/-	-/-	-/-	-/-	-/-	+/+
	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+	-/-	-/-	-/-	+/+
	Fruit	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	+/+	-/-	+/+	-/-	-/-	-/-	+/+
Withania somnifera	Roots	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Leaves	-/-	-/-	+/+	+/+	+/-	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+

Cryzophore tinctora	Leaves	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/+	+/+	-?+	-/-	-/-	-/-	+/+	+/+
	Stem	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+
	Roots	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	-/-
Chenopodium ambrosioides	Leaves	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+
	Stem	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Roots	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
Carthamus oxycantha	Flower	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+
	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+
	Roots	-/-	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+
Conyza canadensic	Stem	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	Leaves	-/-	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	+/+	-/-	+/+	-/-	-/-	-/-	-/-
	Flower	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-
	Roots	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-
Trichodesma indicum	Stem	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	Leaves	-/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	-/-	+/+	+/+	-/-	-/-	-/-	-/-
	Roots	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-
Lantana indica	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Leaves	+/+	+/+	+/+	+/+	+/+	+/+	-/-	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+
	Flower	+/+	+/+	+/+	+/+	+/+	+/+	-/-	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+
	Roots	-/-	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	+/+	-/-	-/-	+/+	+/+
Lactuca dissecta	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Leaves	+/+	+/+	+/+	+/+	-/-	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	-/-	+/+	+/+	+/+	-/-	-/-	+/+	+/+
	Roots	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	-/-

Achyranthus aspera	Stem	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+
	Thorne	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Leaves	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Roots	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
Malvestrum coromadnalninum	Stem	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-
	Roots	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
	Leaves	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-
Silybum marinumte	Leaves	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+
	Roots	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+
Coronopus didymus	Leaves	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	+/+	-/-	-/-	-/-	-/-	-/-	+/+
Calotropis procera	Leaves	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	+/-	+/+	+/+
	Stem	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	-/-	+/+	-/-	+/+	-/-	+/+	-/-	-/-	+/+	+/+
	Fruit	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	-/-	+/+	+/+	+/+
	Latex	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
	Roots	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
Colocasia esculenta	Leaves	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/=	+/+	-/-	+/+	-/-	+/+	-/-	+/+	+/+	+/+
	Stem	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+	+/+
Echinops echinatus	Whole plant	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	+/+	-/-	-/-	-/-	+/+
Sassuria heteromalia	Whole plant	+/+	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-	+/+
Sapium sebifers	Leaves	-/-	+/+	+/+	+/+	+/+	+/+	-/-	-/-	-/-	+/+	-/-	-/-	-/-	-/-	+/+	+/+	-/-	+/+	-/-	-/-	-/-	-/-	-/-	+/+	+/+	-/-

Abbreviations;: += presence , - = absence, ALk. = Alkaloid, Carb. = Cabohydrate, Card gly. = Cardiac glycoside, Flav, = Flavonoid, Phe ,= Phenol
Phlob. = Phlobatannine, Am. Acid. = Amino acid, Sap. = Saponins, Tan. = Tannins, Ter. = Terpenoids, Quin. = Quinines, Oxal. = Oxalic acid, Ster. = Sterols

CONCLUSION

It is evident from the present study that the selected plants have different metabolites which are known for their poisonous effects on the user/ fishes. Some of them have cardiac glycosides, flavonoid, saponins, terpenoids *etc,* which can be easily extracted and used as natural piscicidal

agents. In many countries like India, Nigeria, Nepal, these chemicals are being used for the eradication of unwanted fishes from the ponds.

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