

REVIEW

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# Traditional uses, phytochemistry, pharmacology and toxicity of *Arisaema* (Areaceae): a review

Heena Ali<sup>1</sup> and Ubaid Yaqoob<sup>2\*</sup>

## Abstract

**Background:** The genus *Arisaema* (Areaceae), popularly known as cobra lilies and jack in pulpit is mainly found in temperate to tropical areas of all continents except South America, Europe and Australia and contain about more than 250 species. *Arisaema* genus is being used by the different folks of human populations for medicinal as well as food purposes. *Arisaema* plants are used for the treatment of different types of diseases. There have been several attempts to highlight different aspects of genus *Arisaema* by describing it in terms of phytochemistry and medicinal uses. The present study is, however, an attempt to put together all the former data available related to the phytochemistry and medicinal uses of genus *Arisaema*.

**Main body:** The phytochemicals of the plant include alkaloids, phenols, terpenes, flavonoids, lectins, saponins, glycosides, triterpenoids, stigmasterols, *n*-alkanes, *n*-alkanols sitosterols, campesterol, oxalates, coumarins, tannins etc. Moreover, the properties such as antioxidant, antifungal, antibacterial, insecticidal, antimicrobial, cytotoxic, nematocidal, antiallergic antitumour and anticancer activities are also shown by the plants belonging to genus *Arisaema*. *Arisaema* plants have been traditionally used to treat various ailments such as resolving phlegm, dampness, and to treat asthma, bronchitis, cold, cough, and laryngitis etc. It has been found that there are several species which are toxic by nature. The development of clinical applications of arisaematis rhizomes had been seriously constrained due to its toxic properties like, mouth and lingua pain, even respiration slowing and suffocation, mucous membrane and skin irritation etc. and this toxicity of arisaematis rhizomes is due to raphide components.

**Conclusions:** The collection of data available on the phytochemistry of genus *Arisaema* is not sufficient as further work is required to do on phytochemical and medicinal basis. The data available on phytochemistry and medicinal properties of the plants belonging to genus *Arisaema* throws light on various species of *Arisaema* which are medically important and have been exploited to treat different types of diseases in the world.

**Keywords:** *Arisaema*, Areaceae, Phytochemistry, Medicinal uses, Toxicity

## Background

The human beings are in search of cure to different diseases by natural therapies especially by different parts of plants and herbs. This paved way to the study of different plants to find novel ways of treatment and several plants

have been recognized as medicinally important. Consequently, the research on medicinal plants has gone at a pace that matches no parallel in the history (Newman et al. 2000). Among these medicinally important plants comes the name of genus *Arisaema* that has around 250 species and every known species is used for different medicinal purposes. The species of *Arisaema* have been found in different parts of the world which include Eastern Africa, central Africa, Asia and eastern North America (Suresh et al. 2017).

\*Correspondence: ubaidyaqoob@spcollege.edu.in

<sup>2</sup> Department of Botany, Sri Pratap College, M. A. Road, Srinagar, J&K 190001, India

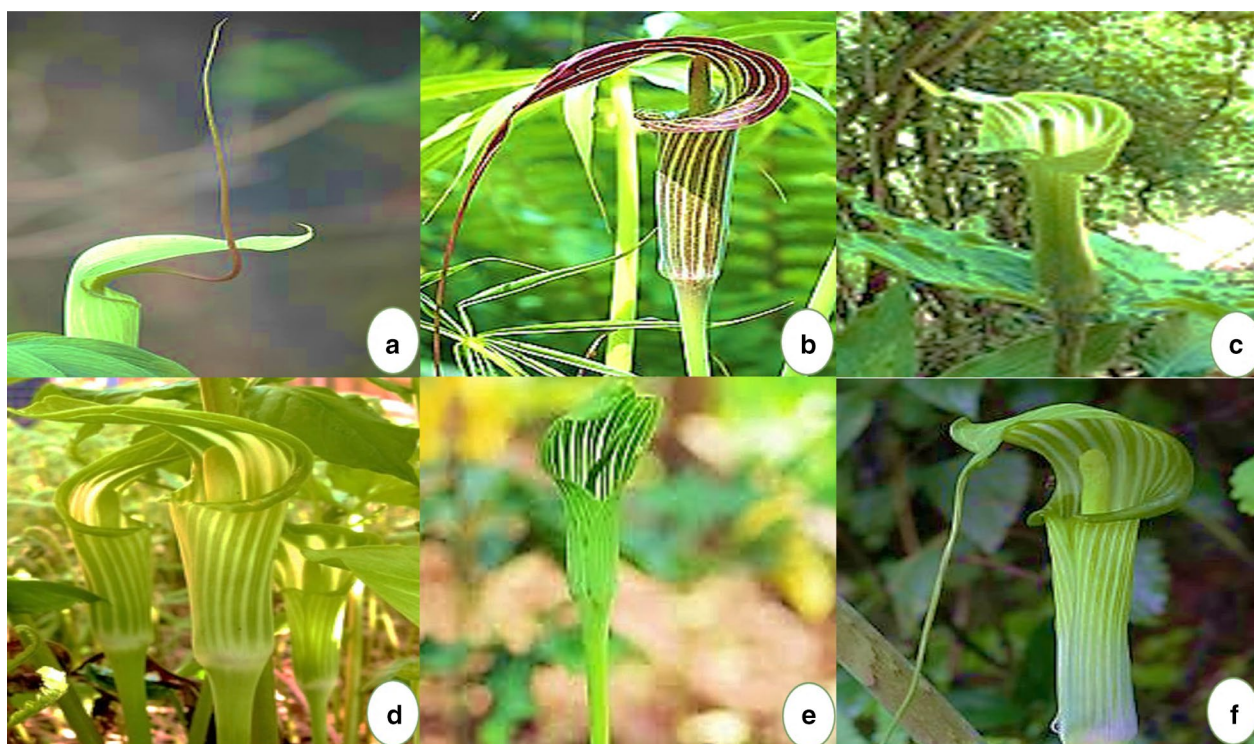
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A brief account of morphology of some of the species is given below:

- (a) *Arisaema tortuosum* commonly known as whipcord Lily has whip like green and purple spadix. Flower can be up to 30 cm long and bisexual. Plant attains a height upto 2 m and grows in aggregation. It is usually regenerated by offsets or seeds (Fig. 1a).
- (b) *Arisaema erubescens* has spathe inflorescence which is greenish having cylindrical 6 cm tubers. The tuber is globose in outline and is having 3 cataphylls which are dark green in colour carrying white spots (Fig. 1b).
- (c) *Arisaema serratum* is a perennial herb which produces two leaves with 7–13 leaflets. Its blooming period is from May to June. The flowering bract can exhibit variety of shades and is differentiated from others by its small size spathe blade which came to end on the upper part of the mouth (Fig. 1c).
- (d) *Arisaema amurense* is a short cobra lily which forms rapidly growing aggregates in woodland gardens. It forms leaves with five leaflets. The spathe inflorescence arises over the small sized spadix (Fig. 1d).

- (e) *Arisaema yunnanense* is a perennial herb that usually arises from tubers. It exhibits 20–75 cm tall stem with 1–2 leaves. Sometimes the tuber of the plant form short tubercles which get detached from the tubers and can be the source of new plant in the proceeding years (Fig. 1e).
- (f) *Arisaema leschenaultii* is a perennial herb with leaves having tapering tips, lens shaped with 7–12 leaflets. Leaves containing many veins which form an intramarginal vein (Fig. 1f).
- (g) *Arisaema jacquemontii* is having perennial behavior developing from tubers. It forms a flowering stem upto 50 cm tall. The new plants in the subsequent years can be developed from the tubercles and from older tubers.

Present in the East and the West, the plant has been called by different names. As per the different appearance of its flowers, the **Asiatic species** are often called *cobra lilies* while **Western species** are often called *jack-in-the-pulpit*. Among its species, the present study would focus on few medicinally important species such as *Arisaema erubescens*, *Arisaema flavum*, *Arisaema tortuosum*, *Arisaema intermedium* Blume, *Arisaema jacquemontii* Blume, *Arisaema murrayi* Hook, *Arisaema utile*,



**Fig. 1** a *Arisaema tortuosum*, b *Arisaema erubescens*, c *Arisaema serratum*, d *Arisaema amurense*, e *Arisaema yunnanense* and f *Arisaema leschenaultii*

*Arisaema leschenaultii*, *Arisaema amurense*, *Arisaema yunnanense*, *Arisaema serratum*, *Arisaema calcareum*, *Arisaema anurans* among others. In the present study, an attempt is made to highlight the phytochemistry and medicinal uses of different species of genus *Arisaema*, including their location (where the plant is found), traditional uses, toxicity etc.

## Main text

### Location

The species of the genus *Arisaema* are found in different parts of the world. The location of some of its species is given in Table 1.

### Traditional uses

In the ancient times when the modern science was yet to develop, the people used different plants and herbs as treatment to different diseases and ailments. The species of genus *Arisaema* were also used for such purposes. Some of the traditional uses of some species of genus *Arisaema* are briefly given as under (Table 2):

- (a) *Arisaema tortuosum* Among the species of *Arisaema*, it has been exploited traditionally to cure rheumatism and stomachache (Jain et al. 2005;

Hussain et al. 2006), snake-bite (Bhatt and Negi 2006), piles (Suresh et al. 2011), digestive tract ailments including constipation, indigestion, abdominal pain, dysentery (Gangwar et al. 2010) and used as contraceptive (Paulsamy et al. 2017). It has been also used against nematodal infections (Choudhary et al. 2008), dog bite and liver complaints (Jain et al. 2005). The rhizomes of the plant are used as antihelmentic whereas tubers are used as anti-nematodal and wound healing (Verma et al. 2012).

- (b) *Arisaema leschenaultii* Blume The Asiatic species *Arisaema leschenaultii* Blume is commonly known as Dhei or cobra (Shaw and Willis 1973). It is used traditionally in Ayurveda system of medicine to cure urinary tract diseases, colitis, eczema, purging, gonorrhoea, piles, haemorrhoids, syphilis, roundworm, fistula and sinus (Mathew 1999).
- (c) *Arisaema erubescens* Several biological disorders have been treated by this plant in the Chinese traditional medicine. *Arisaema erubescens* (Wall.) is used in Chinese traditional medicine to discard damp-phlegm, to prevent convulsions, and to elevate the subsidence of induration and swelling (Yang et al. 2007).

**Table 1** Location of some of the species of *Arisaema*

PLANT	Location	References
<i>Arisaema erubescens</i>	Central and Southern China	Ducki et al. (1995)
<i>Arisaema flavum</i>	Nanital and Uttranchal (India)	Singh and Kamboj (2004)
<i>Arisaema tortuosum</i>	In the regions of scrub and alpine meadows in the Himalaya Southern India, western China, Myanmar and Rhododendron forest areas, Baragali, Khyber Pakhtunkhwa Pakistan	Nile and Park (2014), Azam et al. (2016)
<i>Arisaema intermedium</i> Blume	Shimla, Asia, Africa, Pacific	Damme et al. (1995), Kaur et al. (2005), Kaur et al. (2009)
<i>Arisaema wallichianum</i>	Shimla, Asia, Africa, Pacific	Damme et al. (1995), Kaur et al. (2005), Kaur et al. (2009)
<i>Arisaema Jacquemontii</i> Blume	Shimla, Lakary mountains, Shamshaki, District Karak, Khyber Pakhtunkhwa, Pakistan upper forest and lower alpine zone in the drier areas of Himalayas in the range of 2400–4000 m, nilgiri hills in khasi, hill regions of north east india, and in southern india Himalayan forests at an altitude of 2300–4300, mountaneous areas of kalam Khyber pakhtunkhwa Pakistan, Afganistan, China, Nepal	Kunkel (1984), Damme et al. (1995), Kaur et al. (2006), Sudan et al. (2014), Banyal et al. (2014), Tabassum et al. (2019)
<i>Arisaema murrayi</i> Hook	Maharashtra including, Lonawala, Khandala, Mulshi (Dongarwadi) Satara (kas), Mahableshwar and Radhanagari	Sagar et al. (2014)
<i>Arisaema utile</i>	Pulwama (Jammu & Kashmir)	Mubashir and Shah (2012)
<i>Arisaema leschenaultii</i>	Srilanka, south India in the hills of Karnataka, Kerala and Tamil Nadu	Fyson (1932), Shaw and Will (1973), Selvakumari (2015)
<i>Arisaema anurans</i>	China, Siberia, Mongolia, and Korea	Zhu et al. (2013), Jia et al. (2018)
<i>Arisaema franchechianum</i>	China including Yunan, Sichuan, Guizhou and Guanxi, Song-mong country of Yunan region China, Guang wan	Hu et al. (2012), Li et al. (2013)
<i>Arisaema curvatum</i> kunth	Hills of Nanital situated in the western range of Himalayas at altitude of ascending upto 2300 m	Singh et al. (2008)
<i>Arisaema lipens</i>	Mossy forests and bamboo copses of Hunan, South east Tibet, Yuman, S.chuan, Guizhou and Guangxi	Li et al. (1979)

**Table 2 Traditional uses of some species of genus *Arisaema***

S.no	Species	Common Name	Part used	Traditional uses	References
1	<i>Arisaema amurense</i>	Amur jack in pulpit	Tubers and rhizomes	It is used to cure rheumatism, ulcers of digestive tract, tumour, and is used against pests. It has also been used as pain killer and as anticonvulsant	Chung et al. (1995), Jung et al. (1996a, b), Zhao et al. (2010)
2	<i>Arisaema Tortuosum</i>	Whipcord cobra lily	Tubers	It is used to cure rheumatism, stomach, snake bite, piles, constipation, indigestion, abdominal pain, dysentery, contraceptive, nematodal infections, dog bite and liver infections. It is also used to cure inflammation, stress, wounds of cattle to kill parasites, gout, hyperuricemia, and is used to detect the poisonous effects of snake bite. It's dried tubers are used in respiratory problems	Hussain et al. (2006), Sharma and Majumdar (2003), Jain et al. (2005), Uniyal and Shiva (2005), (Bhatt and Negi, 2006), Paulsamy et al. (2017), Choudhary et al. (2008), Gangwar et al. (2010), Kamble et al. (2010), Suresh et al. (2011), Pragada et al. (2012), Nile and Park (2014)
3	<i>Arisaema Jaquemontii</i>	Sap-ki booti or snake herb	Tubers	It is used to cure respiratory infections, intestinal worms, skin problems including pimples, blisters, ring worms, and is used as a massage on muscles to regain muscular strength. It is also used as anti convulsant and as antidote for snake bites.	Rao (1981), Bibi et al. (2010), Verma et al. (2012), Iqbal et al. (2018)
4	<i>Arisaema leschenaultii</i>	Dhei or cobra lily	Corm	It is used to treat urinary tract diseases, colitis, eczema, purging, gonorrhoea, piles, haemorrhoids, syphills, round worm, sinus, wound healing, and skin diseases	Fyson (1932), Shaw and Will (1973), Agarwal (1997), Mathew (1999), Pallithanam and Mathew (1999)
5	<i>Arisaema erubescens</i>	Blushing cobra lily	Rhizome	Its rhizomes are used to in eliminating dampness, resolving phlegm, expelling wind, relieving convulsions, removing swelling and lumps and to elevate subsidence of induration. These rhizomes are also used for stomachic disorders	Zhu et al. (1999), Mao et al. (2001), Liu et al. (2011), Du et al. (2011)
6	<i>Arisaema lobatum</i>	Chinese cobra lily	Tubers	It is used against malaria, intestinal parasites, snake and insect bites in humans and animals	Zhu et al. (2013)
7	<i>Arisaema cumbile</i>		rhizomes	It is exploited to treat dermatitis and neurological disorders	Hu et al (2009), Sudan et al. (2014)
8	<i>Arisaema franchetianum</i>	Hugo aka cobra lily	Tubers	It is used for snake bites, used to elevate subsidence of induration, swelling, quicken blood-flow, relieve pains, and as anti-inflammatory. It has also been used to kill the intestinal parasites of humans and animals	Li et al. (2013), Zhu et al. (2013)
9	<i>Arisaema calcaicum, Arisaema serratum, A. asperatum, A. heterophyllum</i>		Rhizomes and tubers	These species are used to cure tumour, to kill pests, and as pain killer	Zhao et al. (2010)
10	<i>Arisaema heterophyllum, A. peninsulae, A. robustum, A. consaguineum and A. japonicum</i>		Tubers, rhizome	Used as anticonvulsants	Jung et al. (1996a)



- (d) *Arisaema calcareum* In traditional Chinese medicine the rhizomes or tubers of *A. calcareum* are used against tumour and pests and also used as painkiller (Zhao et al. 2010).
- (e) *Arisaema serratum* In traditional Chinese medicine the rhizomes or tubers of this plant are used against tumour and pests and also used as painkiller (Zhao et al. 2010).
- (f) *Arisaema asperatum* In traditional Chinese medicine the rhizomes or tubers of this plant are used against tumour and pests and also used as painkiller (Zhao et al. 2010).
- (g) *Arisaema heterophyllum* Blume In traditional Chinese medicine the rhizomes or tubers of this plant are used against tumour and pests and also used as painkiller (Zhao et al. 2010).
- (h) *Arisaema amurense* In traditional Chinese medicine the rhizomes or tubers of this plant are used against tumour and pests and also used as painkiller (Ducki et al. 1996).
- (i) *Arisaema yunnanense* This is a plant belonging to genus *Arisaema* which adulterates the tubers of a plant namely *Pinellia ternata* which were used in Chinese traditional medicine (Liu and Guo 2010).
- (j) *Arisaema jacquemontii* Blume It is an herbaceous plant used as traditional cure to different ailments. Its usage is recorded as an anti-convulsant in the Chinese traditional medicine. It is also known for its physiological properties in the folk medicine system (Kunkel 1984). The juice extracted from the tubers of this plant applied to the skin is used to cure ring worms and other skin diseases by the Garo and khasi tribes of Meghalaya (Rao 1981). The oil obtained by grinding the rhizomes of *Arisaema jacquemontii* is used to make a paste that can be used for massage purposes to recover muscular strength and is also used to cure skin problems including pimples and blisters (Khan 2007). Fruit decoction is used against snake bites (Banyal et al. 2014).
- (k) *Arisaema tortuosum* (Wall.) It is also called Whipcord Cobra Lily. It is used in Indian folk medicine to cure different diseases related to stress and inflammation (Pragada et al. 2012; Nile and Park 2014). The juice and dried powder obtained from the tubers were used to apply for snake bites and to the wounds of cattle in order to kill any parasites (Sharma and Majumdar 2003; Choudhary et al. 2008). The plant was also used by Indian tribal people to cure various ailments associated with digestive tract like constipation, indigestion, abdominal pain and dysentery (Murty and Rao 2010).

#### Medicinal uses and phytochemical description:

Various chemical compounds obtained from different species of *Arisaema* are summarized in Table 3

- (a) *Arisaema erubescens* The extracts from *Arisaema erubescens* have shown anticancer properties. The agents which bestow anticancer action to this plant are not known yet. Paeonol and a crystalline solid which has been identified as aurantiamide acetate (4) (Fig. 2) have been obtained from methanol extract of dried *Arisaema erubescens* (Ducki et al. 1996). These extracts have shown growth inhibitory effects in vitro and these same extracts have shown antitumour effects against Si80, solid hepatoma and U14 cervical cancers in vivo. Clinically the plant extract from *Arisaema erubescens* was effective in treating patients suffering from cervical cancer (cure rate: 78%). Gastric, oesophageal, pituitary, lung, and brain cancers have also been treated by this plant. *A. erubescens* contain alkaloids and saponins but the components which bestow antitumour effects are not known yet (Ducki et al. 1995). Various researches have revealed that *Arisaema* rhizome is rich in alkaloids, saponins, triterpenoids and lectins (Shangary et al. 1995), so exhibited the abilities of eliminating dampness, resolving phlegm, expelling wind, relieving convulsions, removing swelling and lumps. The ethanolic extract of tubers of *Arisaema erubescens* (Wall.) yielded two nematocidal flavone-C-glycosides namely Schaftoside and isoschaftoside (5) which possess great nematocidal activity against the root-knot nematode (*Meloidogyne incognita*) nematode responsible for huge crop losses (Du et al. 2011). Different chemical compounds were obtained from this *A. erubescens* which have been listed as aurantiamide acetate, calcium oxalate (2), paeonol, monoterpenoids, fatty acids, flavonoids and alkaloids (Ducki et al. 1995), and ethanolic extracts of its tubers exhibit insecticidal activity against the house flies (*Musca domestica*). The *n*-butanol obtained from the ethanolic extracts of tubers of *A. erubescens* strongly shows molluscicidal activity against *Oncomelania hupensis* (Zhang et al. 2009).

Administration of *Arisaema* rhizomes in rats showed poisonous effect as revealed by interruption in energy metabolism, perturbation of gut microflora environment, vacuole formation in glomerular matrix, inflammation of renal tubular epithelial cells in kidney, membrane damage, and folate deficiency and injury. Rhizomes of *Arisaema erube-*

**Table 3 Various chemical compounds obtained from different species of *Arisaema***

Sno	Plant species	Compound	Used against	Result	References
1	<i>Arisaema curvatum</i> Kunth	Lectins	Bactroera cucurbitae	significant reduction in the percentage pupation and emergence of the adults	Singh et al. (2008)
2	<i>Arisaema jacquemontii</i>	Lectins	Bactroera cucurbitae and in vitro proliferation of HCT-15 (82%), HOP-62 (77%), SW-620 (73%) and HT-29 (70%) cancer cell lines	A monocol lectin having potent anti-insect and anti-proliferative activity, anticancerous activity	Kaur et al. (2006), Tanveer et al. (2013)
		oxalic acid (1) (Fig. 2) and calcium oxalate (2) crystals; tannins, sterols, flavonoids, saponins, a calcium oxalate (2), alkaloid, protein, carbohydrates and oils	Skin diseases, ring worm, against insects, bacteria etc	Antibacterial activity, insecticidal activity antiproliferative activity, and successful in curing skin diseases and ring worms	Iqbal et al. (2018)
		terpenoids, Coumarins (51), quinones, glycosides Alkaloids, anthraquinones, flavonoids, phenols, and phenolics	mitogen induced T-cell and B-cell proliferation Immune Suppressed, Swiss albino mice, microbes and in food preparations	Considerable antioxidant, anti-tumour and immunomodulating potential	Sudan et al. (2014), Baba and Malik (2015)
		Triterpenoids, Arginine (18), Aspartic Acid (19), Leucine (20) (21), Serine (22), Threonine (23), Tyrosine (24) Arisaeminone (25), valine (26) 13-phenyltridecanoic acid (27) Alanine (17),	Against Plasmodium berghei vincke	strong antimalarial activity, helps in attaining muscular strength and useful for skin problems like blisters and pimples	Kletter and Kriechbaum (2001), Khan (2007), Jeelani et al. (2010), Banyal et al. (2014)
3	<i>Arisaema erubescens</i>	Aurantiamide acetate (N-benzoyl-1-phenylalanyl-L-1-phenylalanylalaninol acetate); Paenol	Cancer disease	anticancer properties both in vitro and in vivo; Cytotoxic and anticancerous	Ducki et al. (1995)
		alkaloids, saponins, triterpenoids and lectins	dampness, resolving phlegm, expelling wind, relieving convulsions, removing swelling and lumps	Eliminated dampness, resolving phlegm, expelling wind, relieving convulsions, removing swelling and lumps	Shangary et al. (1995), Jeelani et al. (2010), Liu et al. (2011)
		Nematocidal Flavone-C-Glycosides (schaffoside and isoschaffoside)	Nematodes	Nematocidal activity	Du et al. (2011)
4	<i>A. Intermedium</i> Blume and <i>A. wallichianum</i> Hook	Lectins	Insect pests, Bactroera cucurbitae (Coquillett),	Antiinsect	Kaur et al. (2005)
5	<i>Arisaema decipiens</i>	piperidine alkaloid (2-dimethyl-3-hydroxy-6-(9-phenylonyl) piperidine and tetrao-triterpenoids (6-deacetylrimbin, 28-deoxonimbolide and nimbin and limnoids	MCF-7 cell line, K562 and SK-OV-3 cell cancer cells, and tumour	Inhibition on MCF-7 cell line, K562 and SK-OV-3 cell cancer cells, and against tumour	Zhao et al. (2010)
6	<i>A. amurense</i>	Cytotoxic diacylglycerolgalactosides and antihypertoxic cerebrosides	murine leukemia P388 and human colon adenocarcinoma DLD-1 cells	Hepatotoxicity and Anti-cancerous	Jung et al. (1996a)

**Table 3 (continued)**

S no	Plant species	Compound	Used against	Result	References
7	<i>A. helleborifolium</i> Schott	Lectins	Insect pest ( <i>Bactrocera cucurbitae</i> ) and in vitro proliferation of [HOP-62 (lung), HCT-15 (colon)	Insecticidal and inhibition to in vitro proliferation of [HOP-62 (lung), HCT-15 (colon)	Kaur et al. (2006)
8	<i>A. flavum</i>	Lectins, 1,3-phenyltridecanic Acid, Asparagine (28), Cysteine, Glycine (30), Norvaline (31), Ornithine (32), $\beta$ -setosteryl Galactoside (34), $\alpha$ lfa and beta amyirin (33)	J774 and P388D1 murine macrophage cancer cell lines	Antiproliferation of J774 and P388D1 murine macrophage cancer cell lines	Rastogi and Mehrotra, (1979), Singh et al. (2004)
9	<i>A. vulgare</i> Taig	2-alkylpyrrolidine and 2-alkylpiperidine alkaloids		Antitumour activity	Pezzuto et al. (1999)
10	<i>Arisaema yunnanense</i>		Pinellia ternate	adulterant of traditional medicine <i>Pinellia ternate</i>	Liu and Guo (2010)
11	<i>Arisaema tortuosum</i> Schott	The tubers contains <i>n</i> -alkanes, <i>n</i> -alkanol, stigmasterols, sitosterols, campesterol, cholesterol (11), choline chloride, stachydrine hydrochloride (13), Lutin, quercetin, Luteolin	Many cancer cell lines	Anticancerous	Dhuna et al. (2005)
		Flavonoids	human cancer cell lines HT29, SiHa and OVCAR-5	inhibit in vitro proliferation of human cancer cell lines HT29	Migliani (1978), Pullaiah (2006), Nile and Park (2014)
		carbohydrate, glycoside and steroids	Stress and inflammation	Reduces stress level	Nile and Park (2014)
			Nematodes	abcess and antinematodal activity	Verma et al. (2015)
			Nematodes, bacteria ( such as p merabulus aureus, E coli, $\beta$ cerus, S typhii, K pneumonia, p aeruginosa, E faecalis) and against fungi including A. alternata, A niger, A flavus, F solani, F sporium, and P notatum	Antihelminthic activity, wound healing property and growth inhibition of some bacterial and fungal strains	Verma et al. (2012), Azam et al. (2016)
12	<i>Arisaema leschenaultii</i> Blume	Ethanollic extracts, steroids, triterpenoids, reducing sugars, alkaloids, phenolic compounds, flavonoids, tannins, catechins, anthroquinones, saponins, aminoacids, . It has high concentration of saponins, steroids, terpenes, triterpenoids, polyphenols and moderate concentrations of tannins, phylobatannins, flavonoids (52), carbohydrates, anthraquinone (53) and glycosides	Albino mice and guinea pig, diseases, piles,	Antiallergic, cure piles, skin problems	Vinay et al. (2010), Annie selvakumari (2015)
			Microbes, free radicals, allergies and against reproduction in cattles and pigs	Antiseptic properties in buffalo's antimicrobial activity, wound healing activity, antioxidant activity, free radical scavenging activity, antiulcer activity, anti allergic activity, and against reproduction in pigs and cattles	Kumari and Narasimhan (2003), Gunde et al (2009), Vinay jain et al. (2010), (2012, 2015), Suruse et al. (2011), Suresh et al. (2017)

**Table 3 (continued)**

S no	Plant species	Compound	Used against	Result	References
13	<i>Arisaema utile</i> Schott	Lectins	six human cancer cell-lines and human lymph, antimicrobial activity, antioxidant activity, wound healing activity	Potent inhibition towards six human cancer cell-lines and potent mitogenic response towards human lymphocytes	Dhuna et al. (2010)
14	<i>Arisaema ringens</i>	Basic lectins	human cancer cell lines including THP-1 (leukemia), A-549 (lung), HCT15 (Colon), Cervix (Hela) and Prostrate (PC-3), <i>P. aeruginosa - P. vulgaris - S.aureus - B.Subtilis - S. epidermidis, DPPH</i>	Inhibition of haemagglutination	Yagi et al. (2008)
15	<i>Arisaema utile</i>	Methanolic extract, N-acetyl-D-lactosamine	Inflammation, against porcine respiratory and reproductive syndrome virus (PRRSV), human leukemic K562 cells, and human breast cancer MCF-7 cells	Antimicrobial, cytotoxic and antioxidant	Mubashir and Shah (2012)
16	<i>Arisaema franchetianum</i>	Cubanol (38),guaiol (39),eugenol (37), m,linalool (36),Alfa bisobalol (41), carvacrol (40), A novel pyrolicidine alkaloid, (2R*,3S*,5S*)-N,2-dimethyl-3-hydroxy-5-(10-phenyldecyl) pyrrolidine, and 17 compounds were bergenin emodin, caffeic acid, nobiletin, 3-O-b-D-galactopyranosyl-hederagenin 28-O-b-Dxylopyranosyl (1:6)-b-D-galactopyranosyl ester, coniferin, qingyangshengenin methylconiferin, syringaresinol 40-O-b-D-glucopyranoside, gagamine, perillyrine, (S)-1-(10-hydroxyethyl)-b-carboline, 1-(b-carboline-1-yl)-3,4,5-trihydroxy-1-pentanone, 1-methoxycarbonyl-b-carboline (48), indolo[2,3-a] carbazole (49), 4-hydroxycinnamic acid methyl ester, and methyl 4-[2-hydroxy-2-(4-hydroxy-3-methoxyphenyl)-1-(hydroxymethyl)ethyl] ferulate	Anti-inflammatory effect, Inhibitory effect on porcine respiratory and reproductive syndrome virus (PRRSV), human leukemic K562 cells, and human breast cancer MCF-7 cells	Anti-inflammatory effect, Inhibitory effect on porcine respiratory and reproductive syndrome virus (PRRSV), human leukemic K562 cells, and human breast cancer MCF-7 cells	Migliani et al. (1978), Ducki et al. (1996), Jung, et al. (1996a, b), Li and Long (1998), Lee et al. (2000), He et al. (2002), Huang et al. (2004), Bremner et al. (2004), Lamkadem et al. (2005), Mao et al. (2001), Nunomura et al. (2009), Zhao et al. (2010), Sun et al. (2011), Tao et al. (2011), Wang et al. (2007), Su et al. (2013), Mubashir and Shah (2012), Jia et al. (2018)



**Table 3 (continued)**

Sno	Plant species	Compound	Used against	Result	References
17	<i>Arisaema murrayi</i> Hook	Poison	Albino mice	Poisoning on Albino mice that resulted in changes in behavior such as convulsion of limbs, drowsiness, dilation in pupils, and ultimately leading to death. Liver, kidney and small intestine got affected which carries some changes such as liver turns to black on edges and slightly congested, color of kidney changed to black and small intestine showed black or sometimes yellowish patches	Sagar et al. (2014)
18	<i>Arisaema aitorubens</i> , <i>A. stewardsonii</i> , <i>A. Triphyllum</i> (L.) Torr	Oxalates	Has toxic properties	Intense irritation and burning of the mouth and tongue, with associated inflammation, Edema and Salivation. Deadly if tongue swells, blocking the air passage	Pandita et al. (2014)
19	<i>Arisaema anurans</i>	Oxygenated terpenes, phenyl propanoids	Microbes, fungi	Antimicrobial and antifungal	Jia et al. (2018)
20	<i>Arisaema cumbile</i>		Inflammation, skin diseases and mental disorders	Inhibits the production of proinflammatory cytokinins including interleukins, helps to cure dermatitis and neurological disorders	Sudan et al. (2014)

(See figure on next page.)

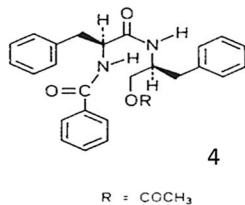
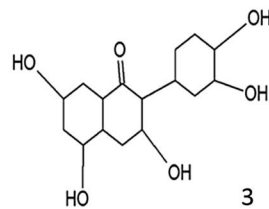
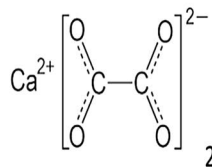
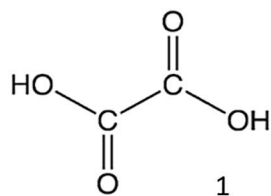
**Fig. 2** Chemical structures of various phytochemicals. (1) Oxalic Acid; (2) Calcium Oxalate; (3) Tannins; (4) Aurentiamide Acetate; (5) Isoschaftoside; (6) Piperidine Alkaloid; (7) Camphosterol; (8) Cerebroside; (9) Sitosterol; (10) Stigmasterol; (11) Cholesterol; (12) Choline Chloride; (13) Stachyhydrine Hydrochloride; (14) Rutin; (15) Quercetin; (16) Luteolin; (17) Alanine; (18) Arginine; (19) Aspartic Acid; (20) Leucine; (21) Lysine; (22) Serine; (23) Threonine; (24) Tyrosine; (25) Arisaeminone; (26) Valine; (27) 13-Phenyltridecanoic Acid; (28) Asparagine; (29) Cysteine; (30) Glycine; (31) Norvaline; (32) Ornithine; (33)  $\alpha$  and  $\beta$  Amyrin; (34)  $\beta$ -Setosteryl Galactoside; (35) *N*-Acetyl-D-Glucosamine; (36) Linalool; (37) Eugenol; (38) Cubenol; (39) Guaiol; (40) Carvacrol; (41) Basobalol; (42) Pyrolidine Alkaloid; (43) Berganin; (44) Emodin; (45) Caffeic Acid; (46) Nobelitin; (47) Gagamine; (48) 1-Methoxycarbonyl-B-Carboline; (49) Indolo[2.3-A]Carbazole; (50) Piperidine Iodide; (51) Coumarin; (52) Flavonoid; (53) Anthraquinone

*scens* (Wall.) Schott has, anticoagulant, stomachic analgesic, sedative, antiemetic, anti-inflammatory and antitumor activities (Mao et al. 2001). Rhizomes of *Arisaema* are indispensable for managing stroke, hemiparalysis, fever, epilepsy, cancer vertigo, and tetanus. Phytochemicals present in *Arisaema* rhizomes are beta-sitosterol, lectins, dipeptides, saponins, triterpenoids and alkaloids (Shangary et al. 1995; Wang et al. 1997; Jeelani et al. 2010).

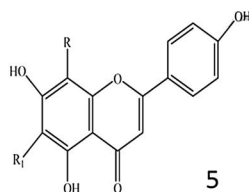
- (b) *Arisaema flavum* Lectin obtained from *Arisaema flavum* shows antiproliferative activity towards murine cancer cell lines, and potent mitogenic activity towards human peripheral blood mononuclear cells (HPBMC and BALB/c splenocytes as indicated by lymphoproliferation after incorporation of lectin into the cultures. It is known to synthesize biogenic silver nano particles effectively which imparts photocatalytic and antibacterial property to it. It showed potential antimicrobial activity against both gram negative and gram positive bacteria (*E. coli* BL-21, *Bacillus subtilis*, *Staphylococcus aureus*, *Pseudomonas putida* and Engineered *E. coli* sub strain QH4) (Rahman et al. 2019).
- (c) *Arisaema tortuosum* From the tubers of *Arisaema tortuosum*, popularly known as Himalayan Cobra lily, a lectin with in-vitro anticancer activity against established human cancer cell lines has been purified by affinity chromatography on asialofetuin-linked amino activated silica beads. *Arisaema tortuosum* is having complex specificity towards a serum glycoprotein asialofetuin and also towards N-acetyl-D-lactosamine (LacNAc) (Dhuna et al. 2005). In addition, aesthetic, antihepatotoxic, anticancerous, antimicrobial and antioxidant properties are exhibited by its tubers. The juice and dried powder obtained from the tubers were used to apply for snake bites and to the wounds of cattle in order to kill any parasites (Choudhary et al. 2008). Aesthetic, antihepatotoxic, anticancerous, antimicrobial and antioxidant properties are exhibited by its tubers (Murty and Rao 2010). Flavonoids, alkaloids, saponins, triterpenoids and lectins are present in *A. tortuosum* (Kamble et al. 2010) and a lectin was found

to be the dominant pro-inflammatory component, exhibiting anticancer activity against human cancer cell lines (Dhuna et al. 2005). Its tubers were used in Indian folk medicine and Ayurveda for the treatment of gout, hyperuricemia, and cancer. The presence of quercetin (15), rutin (14), luteolin (16) and lectin in *A. tortuosum* was revealed by phytochemical observation and analysis (Nile and Park 2014). *Arisaema tortuosum* is exploited for abscess and antinematodal activity, its tuber decoction is given to animals for early recovery of fractured bone as well as administered internally to cure piles. It was used to cure stomachache, liver disorders, digestive tract problems including constipation, abdominal pain, dysentery, indigestion and antidote for dog bite by the tribals. Its tubers exhibited good aesthetic, antihepatotoxic, anticancerous, antimicrobial and antioxidant properties. It contains numerous phytochemicals like carbohydrate, glycoside and steroids (Verma et al. 2015). The leaf and tuber extracts of *Arisaema tortuosum* wall found to exhibit strong antibacterial activity due to the presence of various active constituents being solubilized in promising function (Bibi et al. 2011). The assessment of bacterial resistance to antibiotics helps in the administration of various infectious diseases. The uncertain components obtained from different extracts of *Arisaema tortuosum* wall may further helps in coming researches against bacterial illness (Kant et al. 2019).

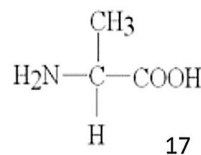
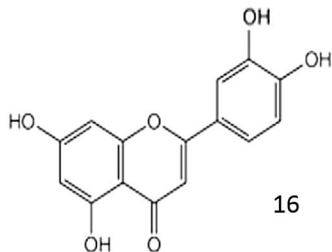
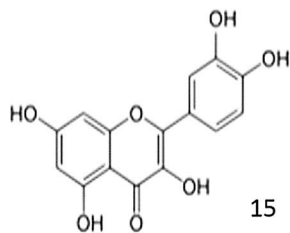
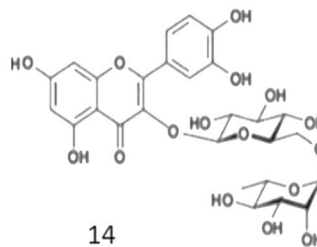
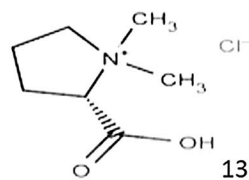
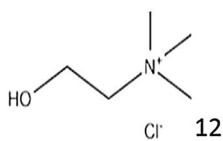
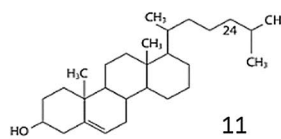
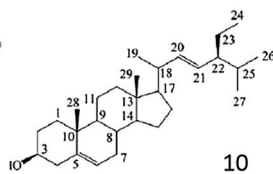
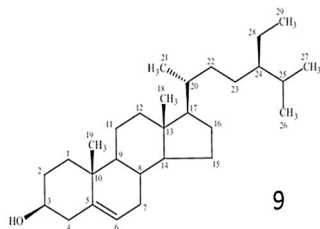
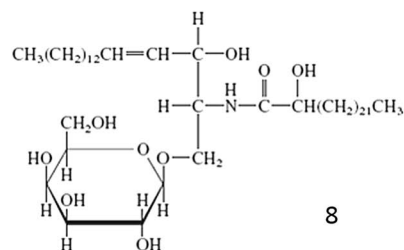
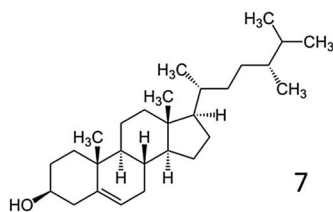
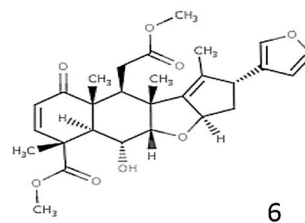
- (d) *Arisaema intermedium* Blume and *Arisaema wallichianum* Hook *A. intermedium* Blume and *A. wallichianum* Hook were proved to be very useful for the detection of various types of cancers as they showed specificity towards *N*-acetyl-D-lactosamine which is important cancer marker (Verma et al. 2015). The lectins from *A. intermedium* Blume and *A. wallichianum* showed greater almost double mitogenic potential towards human peripheral blood mononuclear cells as compared to that of well known mitogen concanavalin A (con A) and these lectins can be used as a means to study the lymphocytes transformation as a model of initia-



R = COCH<sub>3</sub>



Schaftoside R=Arabinosyl RI=Glucosyl  
Isoschaftoside R=Glucosyl RI=Arabinosyl



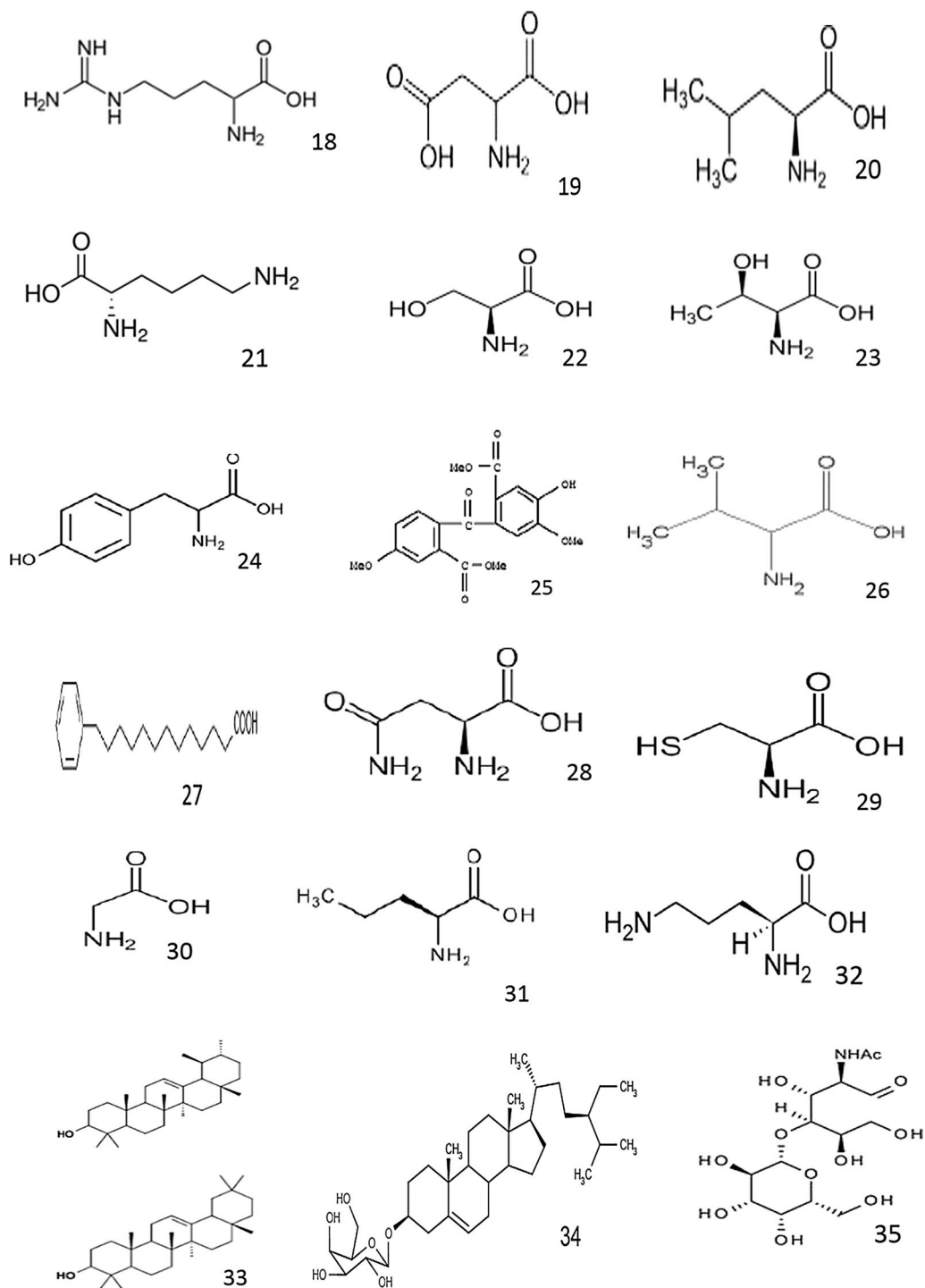


Fig. 2 continued

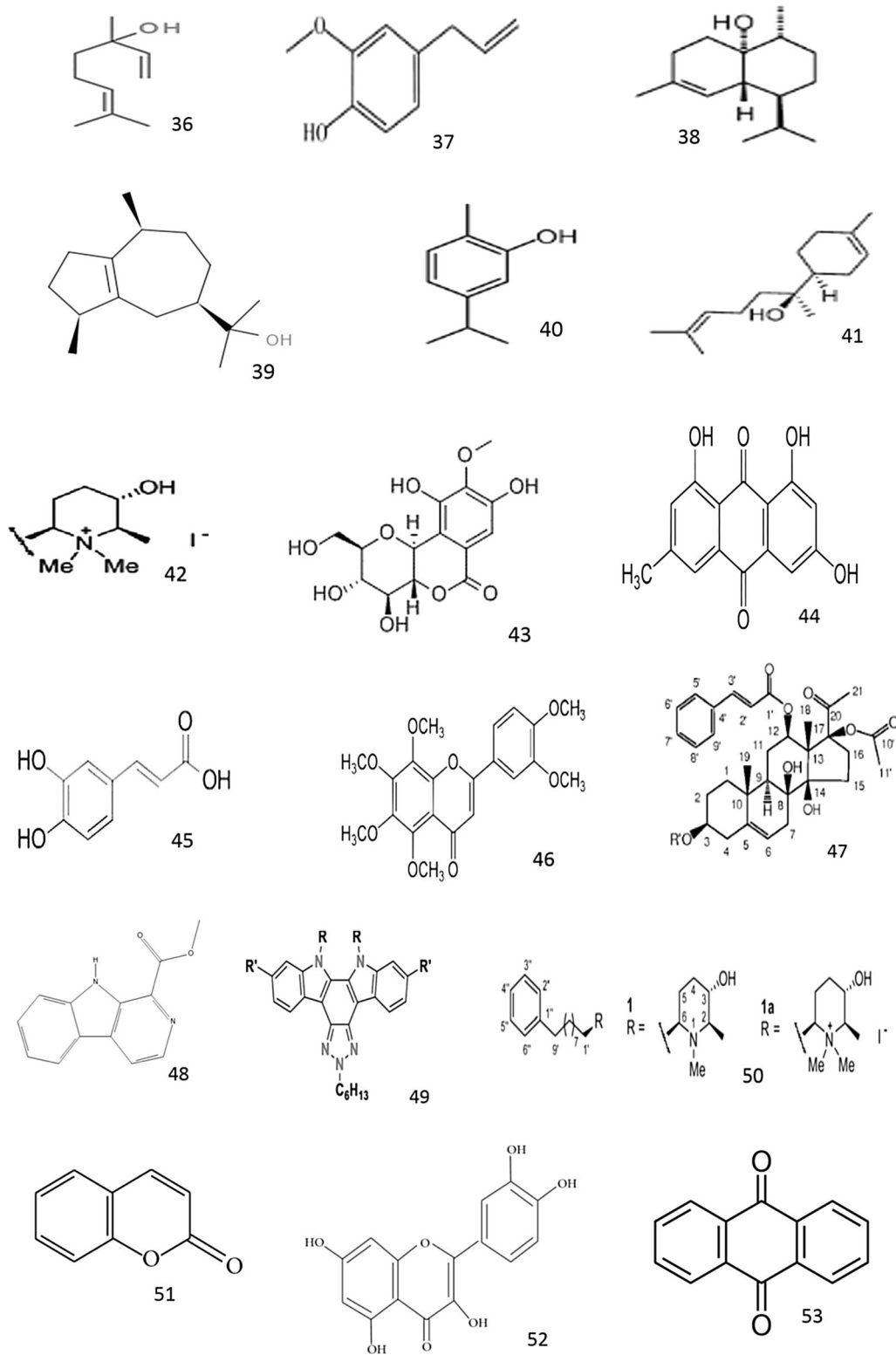


Fig. 2 continued



tion of growth and cell division, antigen activation and to detect the immune potential of an individual (Kaur et al. 2005) like other commercially famous mitogenic lectins such as concanavalin and phytohemagglutinin (PHA). By the process of affinity chromatography on asialofetuin-linked amino activated silica beads, two new lectins were purified from the tubers of *Arisaema intermedium* Blume and *A. wallichianum* Hook. The lectins obtained from these two plant species comprise a major proportion of total protein content and contain glycoproteins 3.4% and 2.9% carbohydrates respectively. These lectins are homotetramers and their subunits are not linked by disulphide linkages (Kaur et al. 2005).

- (e) *Arisaema jacquemontii* Blume The main phytochemicals were obtained from the polar solvent extracts of *A. jacquemontii* which possess marvelous cytotoxic, anticancerous, antioxidant properties and has a strong kinase inhibitor activity. The methanolic and ethanolic *A. jacquemontii* tuber extracts exhibited strong radical scavenging and antioxidant activity. It also possesses great anticancerous activity against some cancer cells for instance HL-60 human leukemia cancer cell lines, DU-145 prostate cancer cell lines. Its roots exhibit two triterpenoids (Jeelani et al. 2010). The extracts of *A. jacquemontii* possess large number of secondary metabolites which paves way to its usage in Pharmaceutical industries (Tabassum et al. 2019). From the tubers of a wild Himalayan cobra lily *Arisaema jacquemontii* Blume a monocot lectin having potent anti-insect and anti-proliferative activity was refined and was nominated as AJL (*A. jacquemontii* lectin) (Kaur et al. 2005). In the storage tissues of *A. jacquemontii* there is presence of the high lectin content of the total extractable proteins and these lectins under reducing as well as non-reducing conditions revealed the absence of disulphide linkages among various subunits which is indicated by the feature of lacking cysteine (29) residues in the amino acid composition of lectins from the araceous plants (Kaur et al. 2006).

**Anti-insect Property** These lectins are useful in defending the crop plants from the invasion and attack of fungal pathogens and insects. There is increasing evidence that these lectins provide shield from the attack of herbivores and other insects and also may act as a precise biodegradable active ingredient in the administration of insect pests (Kaur et al. 2006).

Lectins are proteinaceous compounds formed in species of *Arisaema*. They are found to have capability

of agglutinating erythrocytes. They have a special property of binding carbohydrates due to the presence of non-catalytic domain present in them that actually reversibly get attached to monosaccharides or disaccharides. They actually cause agglutination of erythrocytes by binding with the carbohydrate present on the surface of erythrocytes (Dhuna et al. 2005). *Arisaema* lectins are exploited to know the immune status of an individual suffering from immune disorders, as a source to study the lymphocyte transformation and is useful in cancer research (Singh and Kamboj 2004).

**Anti-proliferative activity** *A. jacquemontii* lectin showed significant constraint on the in vitro multiplication of HCT-15 (82%), HOP-62 (77%), SW-620 (73%) and HT-29 (70%) cancer cell lines. The leaves of *Arisaema jacquemontii* showed immune stimulating effect as depicted by its potential abrogative effect on delayed type hypersensitivity response in immune suppressed balb/c mice, on humoral antibody response and also showed antioxidant activity. As revealed by phytochemical study *Arisaema jacquemontii* contain high amounts of terpenoids, coumarins, quinones, moderate amounts of phenols, glycosides and low quantity of alkaloids, anthraquinones. The paste formed by grounding of *Arisaema jacquemontii* rhizomes with edible oil is used in skin problems like pimples and blisters and also used as massage to recover muscular strength (Sudan et al. 2014). *Arisaema jacquemontii* is an herbaceous plant found in the northern regions of Kashmir and Pakistan and is also found in upper forest and lower alpine zone in the drier areas of Himalayas in the range of 2400–4000 m (Kunkel 1984). A tuber lectin extracted from this plant bestow anti-insect and anti-proliferative activity to it (Kaur et al. 2006) and its fruits and roots are used to treat nervous and psychic disorders. Tetra cyclic triterpenoid and substituted benzophenol (arisae-manone) have been isolated from this plant and it also contains some phytochemicals like terpenes, saponins and glycosides. Its usage is recorded as an anticonvulsant in the Chinese traditional medicine and is known for its physiological properties in the folk medicine system (Tanveer et al. 2014). Its tubers, leaves, and fruits exhibited antimalarial activity against *Plasmodium berghei* vincke but tubers exhibited strong antimalarial activity against *Plasmodium berghei* (Baba and Malik 2015). It is used in the treatment of respiratory infections, intestinal worms, dermatitis, and as an antidote for snakebites (Verma et al. 2015). Anti-insect and anti-proliferative properties were shown by the lec-

tins obtained from its tubers (Kaur et al. 2006). The leaves of *A. jacquemontii* shows antioxidant, immunomodulating potential (Sudan et al. 2005), anti-convulsant activity and an effect on platelet aggregation (Jeelani et al. 2010). Due to the presence of high concentration of flavonoids *A. jacquemontii* exhibits strong antimicrobial activity and is known to inhibit some metabolic processes (Cushnie and Lamb 2005) and biosynthesis of nucleic acid. Spore germination of plant pathogens has been found to be retarded by *A. jacquemontii* flavonoids. *A. jacquemontii* showed antifungal, antimicrobial and antibacterial properties. The potential antibacterial activity was shown against some bacteria including *Salmonella enteritidis*, *Micrococcus luteus*, *Streptococcus faecalis* and *Staphylococcus aureus* (Baba and Malik 2015). The juice extracted from the tubers of *A. jacquemontii* is used by the people of India to cure some skin diseases and ringworm and lectin obtained from it has insecticidal and antiproliferative activity. The tubers of *Arisaema jacquemontii* were procured from the mountainous areas of Kalam (Swat), Khyber Pakhtunkhwa province of Pakistan. Phytochemicals present in this plant include tannins, sterols, flavonoids, saponins, alkaloid, protein, carbohydrates and oils and it is due to these bioactive compounds *A. jacquemontii* is bestowed with antibacterial activity (Iqbal et al. 2018).

- (f) *Arisaema murrayi* Hook The phytochemicals found to be present in aqueous extract of *Arisaema murrayi* Hook were picric acid, tannin, protein, sugar, anthraquinone, polyphenols etc. whereas its alcoholic extract contains phytochemicals like flavonoids, alkaloids and glycosides (Sagar et al. 2014).
- (g) *Arisaema ringens* A basic lectin was refined from the bulbs of *Arisaema ringens*. This lectin has two carbohydrate binding sites and identified monooligosaccharides and terminal N acetyllactosamine revealed by hemagglutination inhibition (Yagi et al. 2008).
- (h) *Arisaema utile* Schott A plant lectin has been refined from the tubers of *Arisaema utile* which is a homotetrameric molecule of 54 kDa with subunit molecular mass of 13.5 kDa and shows mitogenic and antiproliferative activity. This lectin exhibited powerful mitogenic response towards human lymphocytes i.e. it initiates the state of growth and procreation of quiescent, non-dividing lymphocytes and had shown noticeable proliferation restrain towards some human cancer cell lines viz. SK-N-

SH (CNS), MCF-7 (Breast), Colo-205 (Colon), 502713 (Colon), HCT-15 (Colon), Hep-2 (Liver), HT 29(Colon),SW-620 (Colon), IMR-32 (Neuroblastoma), DU-145 (Prostate) and PC-3 (Prostate) (Dhuna et al. 2010). The carbohydrates like *N*-acetyl-D-lactosamine and asialofetuin inhibits this lectin induced hemagglutination, *N*-acetyl-D-lactosamine (35) which acts as a particular inhibitor of *Arisaema utile* lectin (AUL) is one of the necessary cancer markers (Ito et al. 1996).

- (i) *Arisaema curvatum* Kunth By affinity chromatography using asialofetuin-linked amino activated porous silica beads the lectin from tubers of cobra lily, *Arisaema curvatum* was refined. The influence of this lectin was studied on the larvae of *Bactrocera cucurbitae*. This treatment lead to prolongation of the remaining larval development period and a significant decrease in the percentage pupation and emergence of the adults from these treated larvae (Singh et al. 2008).
- (j) *Arisaema franchetianum* *Arisaema franchetianum* is well known medicinal plant used to treat the snake bites and as an anti-inflammatory agent in Chinese folk medicine since for a long time. The chemical constituents like pyrrolidine alkaloid, -N,2-dimethyl-3-hydroxy-5-(10-phenyldecyl) pyrrolidine (Su et al. 2013), and many different compounds like bergenin (43) (Migłani et al. 1978), emodin (44) (Ducki et al. 1996), caffeic acid (45) (Zhao et al. 2010), nobiletin (46), (Jung et al. 1996a), 3-O-b-D-galactopyranosyl-hederagenin 28-O-b Dxylopyranosyl (1 ! 6)-b-D-galactopyranosyl ester (Jung et al. 1996b), coniferin (Li et al. 2013) qingyangshengenin (Lamkadem et al. 2005), methylconiferin (Nunomura et al. 2009), syringaresinol 40-O-b-D-glucopyranoside (Sun et al. 2011), gagaminine (47) (Tao et al. 2011), perlolyrine (Wang et al. 2007) (S)-1-(10-hydroxyethyl)-b-carboline, (He et al. 2002) 1-(b-carboline-1-yl)-3,4,5-trihydroxy-1-mpentanone, (Huang et al. 2004) 1-methoxycarbonyl-b-carboline (Ma et al. 2007) indolo [2,3-a] carbazole (Sun et al. 2009), 4-hydroxycinnamic acid methyl ester (Lee et al. 2000), and l4-[2-hydroxy-2-(4-hydroxy-3-methoxyphenyl)-1-(hydroxymethyl) ethyl] ferulate (Bremner et al. 2004) have been extracted from *Arisaema franchetianum* tubers. The pyrrolidine alkaloid (42) exhibited inhibitory action against human leukemic K562 cells, human breast cancer MCF-7 cells, porcine respiratory and reproductive syndrome virus (PRRSV). The cytotoxic piperidine alkaloid (50) obtained from

*A. decipiens* Schott, and its *N*-methyl derivative showed inhibitory response against the K562 and MCF-7 cell line. Collection of *A. franchetianum* tubers was done from Songming County of Yunnan region, China, in June 2010 (Su et al. 2013).

(k) *Arisaema amurense* Several species of *Arisaema* are exploited in the folk medicine for curing ulcer of digestive tract, rheumatism and cancer. The extracts obtained from *Arisaema amurense* Max Var ser-ratum revealed strong phospholipase A2 inhibitory activity due to the presence of the compound 2,3-dihydroxypropyl, 9Z,12Z octadecadienoate (Chung et al. 1995).

(l) *Arisaema leschenaultii* *Arisaema leschnaultii* plant is endemic to Sri Lanka and south India which is used to treat skin diseases and piles. The corm of this plant contains cyanogenic glycosides, and high levels of calcium due to the presence of calcium oxalate (2) crystals and free calcium (Selvakumari 2015).

(m) *Arisaema diciapiens* *A. diciapiens* is one of the perennial herbaceous plant belonging to genus *Arisaema*. From the extracts of the rhizomes of this plant three known tetranortriterpenoids and a new piperidine alkaloid (6) were isolated and their chemical structures were recognized as (-)-(2*R*\*,3*S*\*,6*S*\*)-*N*,2-dimethyl-3-hydroxy-6-(9-phenylnonyl) piperidine, 6-deacetylnimbin, 28-deoxonimbolide and nimbin. This plant is also designated as a natural antitumor herbal medicine as it is the prime source of limnoids.

From *A. amurense* cytotoxic diacylglycerol galactosides against murine leukemia P388, human colon adenocarcinoma DLD1 cells and antihepatotoxic cerebroside(8), from *A. helleborifolium* Schott insecticidal (*Bactrocera cucurbitae*) and in vitro antiproliferative [HOP-62 (lung), HCT-15 (colon) and so forth] lectins and from *A. flavum* antiproliferative lectins against J774 and P388D1 murine macrophage cancer cell lines (Singh et al. 2004) were recognized. Similarly, from *A. vulgare* Targ some alkaloids like 2-alkylpyrrolidine and alkylpiperidine which significantly interact with DNA have been extracted (Melhaoui and Belouali 1998).

(n) *A. propinquum* It has been revealed through large number of experimental evidences that *Arisaema propinquum* exhibits a strong anti-helminthic property. This disclosure was based on investigational studies done on aqueous and methanolic extracts obtained from the rhizomes of *Arisaema propinquum* (Mir et al. 2020).

## Toxicity

By the research on the plants, especially on the species of genus *Arisaema*, it has been found that there are several species which are toxic by nature. The development of clinical applications of arisaematis rhizomes had been seriously constrained due to its toxic properties like, mouth and lingua pain, even respiration slowing and suffocation, mucous membrane and skin irritation etc. and this toxicity of arisaematis rhizomes is due to raphide components including calcium oxalate (2), protein and trace carbohydrates as revealed by previous researches (Liu et al. 2011). Some of the species which are found toxic are mentioned as under:

(a) *Arisaema tortuosum* The plant has toxic character as revealed by the research. The researchers argue that the plant contains calcium oxalate (2) crystals. The presence of these crystals is the cause to produce annoying sensation. Moreover, the intake of its leaf induces vomiting in animal due to its poisonous character.

(b) *Arisaema jacquemontii* Blume Though the plant is used for medicinal purposes, yet it contains toxicity. It is said that because of its similarity with snake cobra, the plant is classified as poisonous plant. In its native region, the people call it by the name of "sap-ki-booti" (The snake herb). The plant also contains minute needle like crystals of calcium oxalate (2). These crystals present in this plant are extremely annoying when brought to contact with the mucus membrane of the mouth, nose and throat, or with tender skin (Kaur et al. 2006).

(c) *Arisaema murrayi* Hook The plant is a poisonous herb. In an experiment, *Arisaema murrayi* (Hook) showed poisonous effect on Albino mice due to which several changes occurred in its behavior like, drowsiness, dilation in pupils, convulsion of limbs and finally lead to death. The affected organs including kidney, small intestines and liver bear some changes such as kidney changed to black, small intestine showed black or sometimes yellowish patches and liver got congested and turned slightly black on edges.

## Conclusions

To top it all, it can be said that there are many medicinally important plants among which *Arisaema* genus has not been studied as it should be. The collection of data available on the phytochemistry of genus

*Arisaema* is not sufficient as further work is required to do on phytochemical and medicinal basis. The present study, among others, authenticate the fact that the world is full of vast diversity of medicinally important plants. Among this diversity, genus *Arisaema* also has large number of plant species which are useful as medicines but some of them have been explored and the rest are unexplored. The large number of data available on phytochemistry and medicinal property of the plants belonging to genus *Arisaema* throws light on various species of *Arisaema* which are medicinally important and have been exploited to treat different types of diseases in the old world as well as in the modern times. The Phytochemicals like lectins, phenols, cerebrosites, alkaloids, calcium oxalates, hydrochlorides, campesterol, choline chloride, stachy hydrine, glycosides, terpenoids, coumarins, quinones etc. have been extracted from the different species of *Arisaema* which are used against different diseases. The enormous work although have been done on the phytochemistry of *Arisaema* but there is still a need to explore more of its species on phytochemical and medicinal basis so that it can be used as a powerful medicine against large number of ailments. Some of its species have also been used as insecticides, for instance against insect pest, *Bacterosa curcurbitae*. The medicinal properties exhibited by the genus has revealed that it could play a vital role in modern medicinal industry as well as in the therapeutics. As cancer disease has become a serious issue in present times, various species of *Arisaema* have been used to treat cancer, for instance *Arisaema utile*, *Arisaema schott*, *Arisaema franchiatum*.

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#### Authors' contributions

HA contributed mostly in writing of the manuscript and collection of information. UY framed the idea and revised the whole manuscript after the writing. All the authors have read and approved the manuscript.

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#### Ethics approval and consent to participate

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#### Consent for publication

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#### Competing interests

The authors declare that they have no competing interest.

#### Author details

<sup>1</sup> Department of Botany, Cluster University, S. P. College Campus, M. A. Road, Srinagar, J&K 190008, India. <sup>2</sup> Department of Botany, Sri Pratap College, M. A. Road, Srinagar, J&K 190001, India.

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