A review on phytochemical constituents and pharmacological properties of Allium victorialis

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ABSTRACT — Plants have been the origin of a few standard meds everywhere throughout the world for a huge number of years and keep on giving new solutions for mankind. Aim of this review is to investigate the secondary metabolites isolated from Allium victorialis and its pharmacological importance. A. victorialis is a type of shrub consists of sulfur compounds, glycosides, alkaloids and saponins used in various ailments. The plant has effective pharmacological activity and shows promising future for further researches. This study on the plant A. victorialis is comprised of review of plant from pharmacological and phytochemical standpoint.

Index Terms— Allium victorialis, Secondary metabolites, Phytochemical, Pharmacological activity.

1. INTRODUCTION

Alliaceae is a group of 700 species with 30 genera dispersed in different pieces of the world. Genus Allium represents this family in Pakistan. Most specialists incorporate the Alliaceae in Liliaceae family (Nasir and Ali, 1975). The Allium as the biggest sort of the family with around 600 species spread everywhere throughout world. 41 species of Allium are present in our country (Nasir and Ali, 1975). Allium characteristics contain bulbs clustered or solitary. Leaves fistular or non fistular , sheathing sometimes well over the ground level. Tepals are one nerved, yellow, pink to reddish purple, white to greenish white, blue or violet colored. Stamens exserted or included; filaments entire, cuspidate or toothed ; anthers oblong to elliptic, dorsi fixed. Seeds are six or more; testa black (Nasir and Ali, 1975).

Among the species, Allium victorialis is shrub, generally develops in mid Asia to Japan, North West America and Europe. It is developed in northern areas of Pakistan (Nasir and Ali, 1975). The leaves are 3-6, petiolate, comprehensively lanceolate to oval. The bulb of this plant is coat reticulate fibrous, round and hollow. Tepals are elliptical, acute to obtuse and white or yellowish white. Filaments are larger than the tepals in size, whole, external smaller, subulate, internal more extensive, lanceolate. Seeds are practically circular. Style is exerted.

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2. RESULTS AND DISCUSSION

2.1 Chemical Composition

Till now 59 secondary metabolites have been accounted for from Allium victorialis present in Pakistan and outside Pakistan (Table 1, Fig 1).

2.2 Pharmacological Importance

2.2.1.Antithrombotic agent

Allium victorialis is a little shrub with blooms pink in color. The bulbs and leaves of this plant are utilized as pot herbs. It is utilized by local people as antiscorbutic (Nasir and Ali, 1975) and antithrombotic agent (Nishimura et al., 1988), and for the treatment of cold and excessive menstruation. The formation of blood clots can be reduced by antithrombotic drugs. The compounds 2-vinyl-4H-l,3-dithiin (2) and 3,4-Dihydro-3-vinyl-1,2-dithiin (1) separated from Allium victorialis, showed antithrombotic activity (Nishimura et al.,1988).

2.2.2 Anticancer activity

Cancer is defined as abnormal growth of cells causing tumors or other changes that prevent normal functioning of the body. The steroidal saponin gitogenin 3-O-lycotetroside (5), kaempferol 3, 4'-di-O-β-D-glucoside (4), and astragalin (3) were found considerably cytotoxic over many cancer cell lines (Kyung-Tae et al., 2001). The ethanolic extract of this plant was found active as anti-inflammatory and anticancer agent against human colon cancer cells while the water extract strongly inhibited α- glucosidase action (Li C. et al., 2011).

2.2.3 Anti neuroinflammatory

The inflammation of the nervous tissue can be suppressed by the use of antineuroinflammatory agents. In a study neuroinflammation suppression was investigated and it was observed that 3-O-β-D-Glucosyl-7-O-β-D-(2-O-feruloyl) glucosylkaempferol (15), allivictoside B (7) , quercetin 3-O-β-D-glucopyranoside (20) and allivictoside F

(11) were effective for the cure of such kind of ailment (Woo et al., 2012).

2.2.4 Aldose reductase activity, high glucose-induced transforming growth factor-beta1

A.victorialis is suitable for the formation of drugs required for diabetic nephropathy as shown in a study that quercitrin (42) significantly inhibited the aldose reductase activity and advanced glycation end product formation (Kim et al., 2013). In the same work, Ferulic acid (46) considerably minimized secretion and expression of high glucose-induced transforming growth factor-beta1 in mesangial cells in mouse kidney.

2.2.5 Antilipid, antiatherogenic, antihepatotoxic activity

The pharmacological properties of water soluble extract of A. victorialis were presented by anti-lipid, hypolipidimic, peroxidative effect on rabbit and mice, anti-atherogenic, and anti-hepatotoxic effects in rats (Trivedi, 2006, Kang et al., 2017). The accumulation of cholesterol in the artery of mouse was reduced by incorporating the ethanol extract of A. victorialis in diet (Kim et al., 2000).

2.2.6 Antioxidant and DPPH scavenging activity

The leaf extract of Allium showed inhibition of cholesterol biosynthesis and antioxidant activity (Lee et al., 2007; Lee et al., 2004). The health enhancing effects of the water and ethanol soluble extracts of this specie were seen in a work, where antioxidant action of water extract was greater than that of ethanolic extract (Li C. et al., 2011). In another study lipid peroxide production was suppressed by the extract of A. victorialis which satisfies its activity as antioxidant (Doh et al, 2011). The leaves extract of Allium victorilis L is more potent than that of roots and stem when tested for inhibitory action opposite to the production of cholesteryl ester hydroperoxide in the blood of rat and DPPH scavenging activity (Kim et al., 2012).

2.2.7 Antibacterial, antifungal activity

In a study, It was seen that the freshly extracted juice of Wild-garlic (Allium victorialis L.) showed strong antibacterial, antifungal activity, but the heat-treated juice didn't exhibited strong antimicrobial and antioxidant activities (Kwon et al., 2010).

2.2.8 Immunotoxicity activity

The essential oil obtained from stems of this specie showed significant toxic action against early fourth-stage larvae of Aedes aegypti L. Among the extracted compounds, Allyl cis-1-propenyl disulfide showed good toxicity against F21 laboratory strain of A. aegypti (Chung et al, 2011).

Conclusion

The present study showed that Allium victorialis is important specie with a large use in the field of medicine and 59 compounds are reported from this plant till now. Further study is required to explore its importance and application in field of medicine on commercial level.

Table 1. Summarized account of various secondary metabolites reported from *Allium victorialis*.

Name of Compounds	Ref.
3,4-Dihydro-3-vinyl- 1,2-dithiin (**1**)	Nishimura *et al*., (1988)
2-Vinyl-4*H*-1,3-dithiine (**2**)	Nishimura *et al*., (1988)
Astragalin (**3**)	Kyung-Tae *et al*., (2001); Woo *et al*., (2012); Kim *et al*., (2013)
Kaempferol 3,4'-di-*O*-*β*-D-glucoside (**4**)	Kyung-Tae *et al*., (2001); Woo *et al*., (2012); Kim *et al*., (2013)
Gitogenin 3-*O*-lycotetroside (**5**)	Kyung-Tae *et al*., (2001)
Allivictoside A (**6**)	Woo *et al*., (2012)
Allivictoside B (**7**)	Woo *et al*., (2012)
Allivictoside C (**8**)	Woo *et al*., (2012)
Allivictoside D (**9**)	Woo *et al*., (2012)
Allivictoside E (**10**)	Woo *et al*., (2012)
Allivictoside F (**11**)	Woo *et al*., (2012)
Allivictoside G (**12**)	Woo *et al*., (2012)
Allivictoside H (**13**)	Woo *et al*., (2012)
Kaempferol 7-*O*-*β*-D-glucopyranoside (**14**)	Woo *et al*., (2012)
3-*O*-*β*-D-Glucosyl-7-*O*-*β*-D-(2-*O*-feruloyl) glucosylkaempferol (**15**)	Woo *et al*., (2012)
3-*O*-*β*-D-(2-*O*-feruloyl)glycosyl-7,4'-di-*O*-*β*-D-glucosylkaempferol (**16**)	Woo *et al*., (2012)
Kaempferol3-*O*-*α*-L-rhamnopyranosyl-(1→6)-*β*-D-glucopyranoside (**17**)	Woo *et al*., (2012)

Kaempferol3,7-di-*O*-*β*-D-glucopyranoside (**18**)	Woo *et al*., (2012); Kim *et al*., (2013)
Quercetin 3,4'-di-*O*-*β*-D-glucopyranoside (**19**)	Woo *et al*., (2012)
Quercetin3-*O*-*β*-D-glucopyranoside (**20**)	Woo *et al*., (2012)
Quercetin7,4'-di-*O*-*β*-D-glucopyranoside (**21**)	Woo *et al*., (2012)
Kaempferol3-*O*-(2''-(*E*)-*p*-coumaroylglucoside)-7-*O*-*β*-D-glucoside (**22**)	Woo *et al*., (2012)
trans-Phytol (**23**)	Kyeong and Kang (2013)
Phytene-1,2-diol (**24**)	Kyeong and Kang (2013)
Icariside B_2 (**25**)	Kyeong and Kang (2013)
(6*S*,9*S*)-Roseoside (**26**)	Kyeong and Kang (2013)
Sedumoside G (**27**)	Kyeong and Kang (2013)
Pinoresinol-4-*O*-glucoside (**28**)	Kyeong and Kang (2013)
2-Methoxy-2-(4'-hydroxyphenyl)ethanol (**29**)	Kyeong and Kang (2013)
2-Hydroxy-2-(4'-hydroxyphenyl)ethanol (**30**)	Kyeong and Kang (2013)
Benzyl *β*-D-glucopyranoside (**31**)	Kyeong and Kang (2013)
Methyl ferulate (**32**)	Kyeong and Kang (2013)
trans-Ferulic acid (**33**)	Kyeong and Kang (2013)
Methyl-*p*-hydroxycinnamate (**34**)	Kyeong and Kang (2013)
Glucosyl methyl ferulate (**35**)	Kyeong and Kang (2013)
Linocaffein (**36**)	Kyeong and Kang (2013)
Siringin (**37**)	Kyeong and Kang (2013)
2-(4-Hydroxy-3-methoxyphenyl)-ethyl-*O*-*β*-D-glucopyranoside (**38**)	Kyeong and Kang (2013)
Pseudolaroside C (**39**)	Kyeong and Kang (2013)
Kaempferol3,7,4'-tri-*O*-*β*-D-glucopyranoside (**40**)	Kim *et al*., (2013)
Kaempferol3,7-di-*O*-*β*-D-glucopyranoside (**41**)	Kim *et al*., (2013)
Quercitrin (**42**)	Kim *et al*., (2013)
Kaempferol (**43**)	Kim *et al*., (2013), Hong *et al*., (2007)
Quercetin (**44**)	Kim *et al*., (2013), Hong *et al*., (2007)
4-Hydroxycinnamic acid (**45**)	Kim *et al*., (2013)
Ferulic acid (**46**)	Kim *et al*., (2013)
β-Sitosterol (**47**)	Khan et al., (2011)
β-Sitosterol 3-*O*-*β*-D-glucopyranoside (**48**)	Khan et al., (2011)
β-Sitosterol acetate (**49**)	Khan et al., (2011)
β-Amyrin (**50**)	Khan et al., (2011)
β-Amyrin acetate (**51**)	Khan *et al*., (2011)
22-Cyclohexyl-1-docosanol (**52**)	Khan et al., (2011)
Alliumonoate (**53**)	Khan *et al*., (2011)
Allumine A (**54**)	Khan *et al*., (2013)
Allumine B (**55**)	Khan *et al*., (2013)
Allumine C (**56**)	Khan *et al*., (2015)
Cyclopent-1-enecarboxylate (**57**)	Khan *et al*., (2013)
Cyaniding3-*O*-(3'',6''-*O*-dimalonyl-*β*-glucopyranoside (**58**)	Andersen Ø.M. *et al* (1995)
cyanidin3-*O*-(3'',0-malonyl-*β*-glucopyranoside) (**59**)	Andersen Ø.M. *et al* (1995)

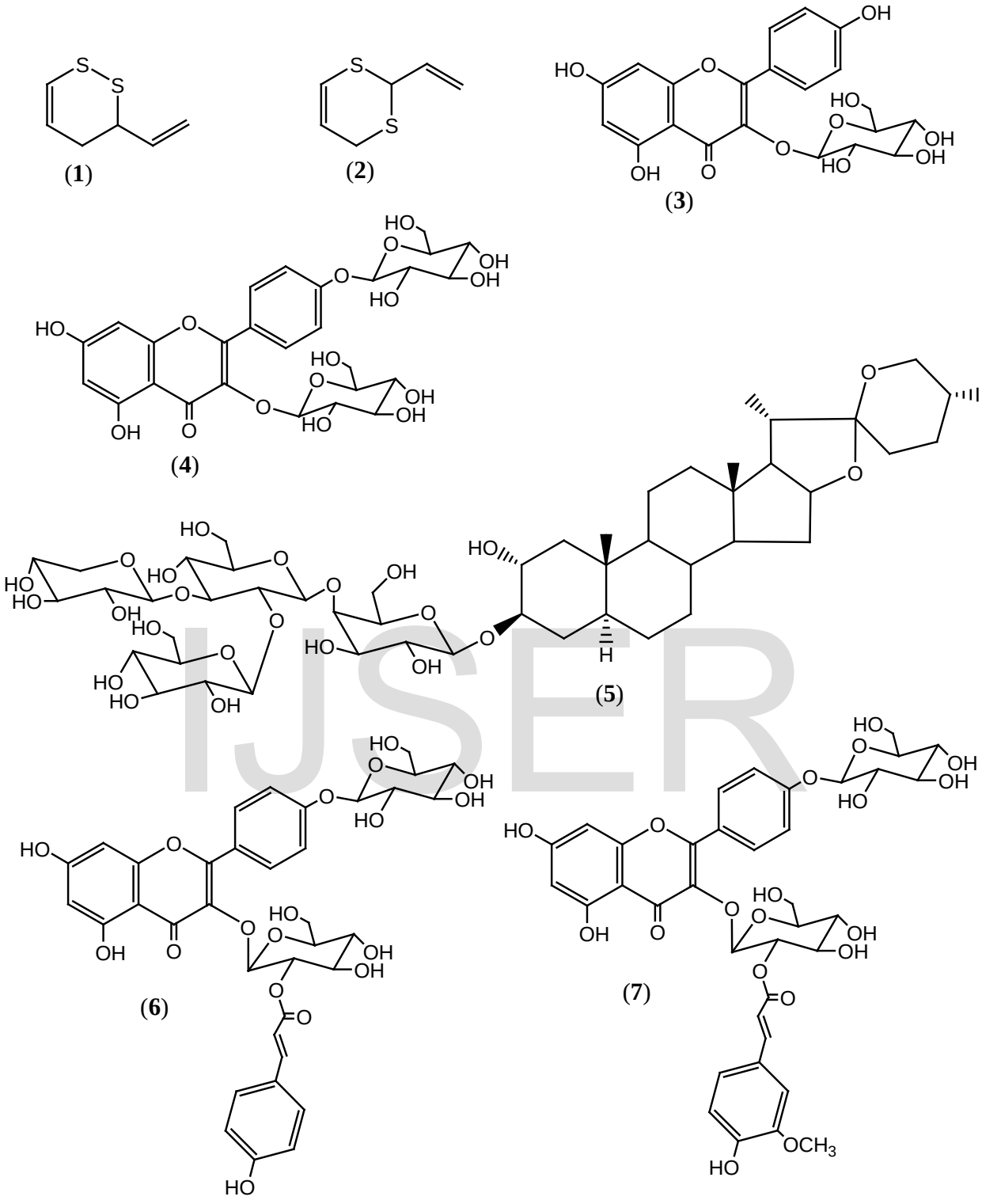


Fig. 1. Compounds isolated from *Allium victorialis*

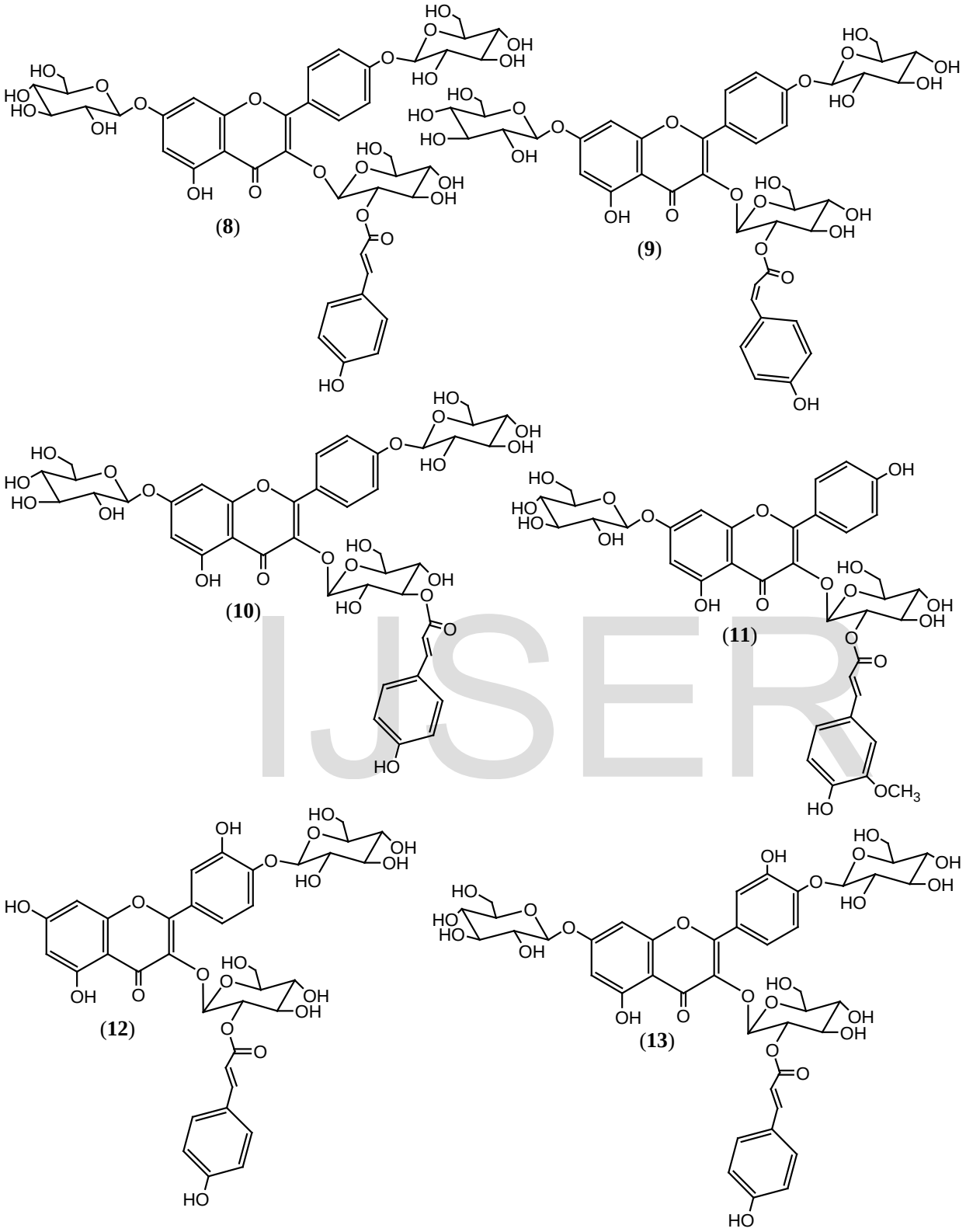
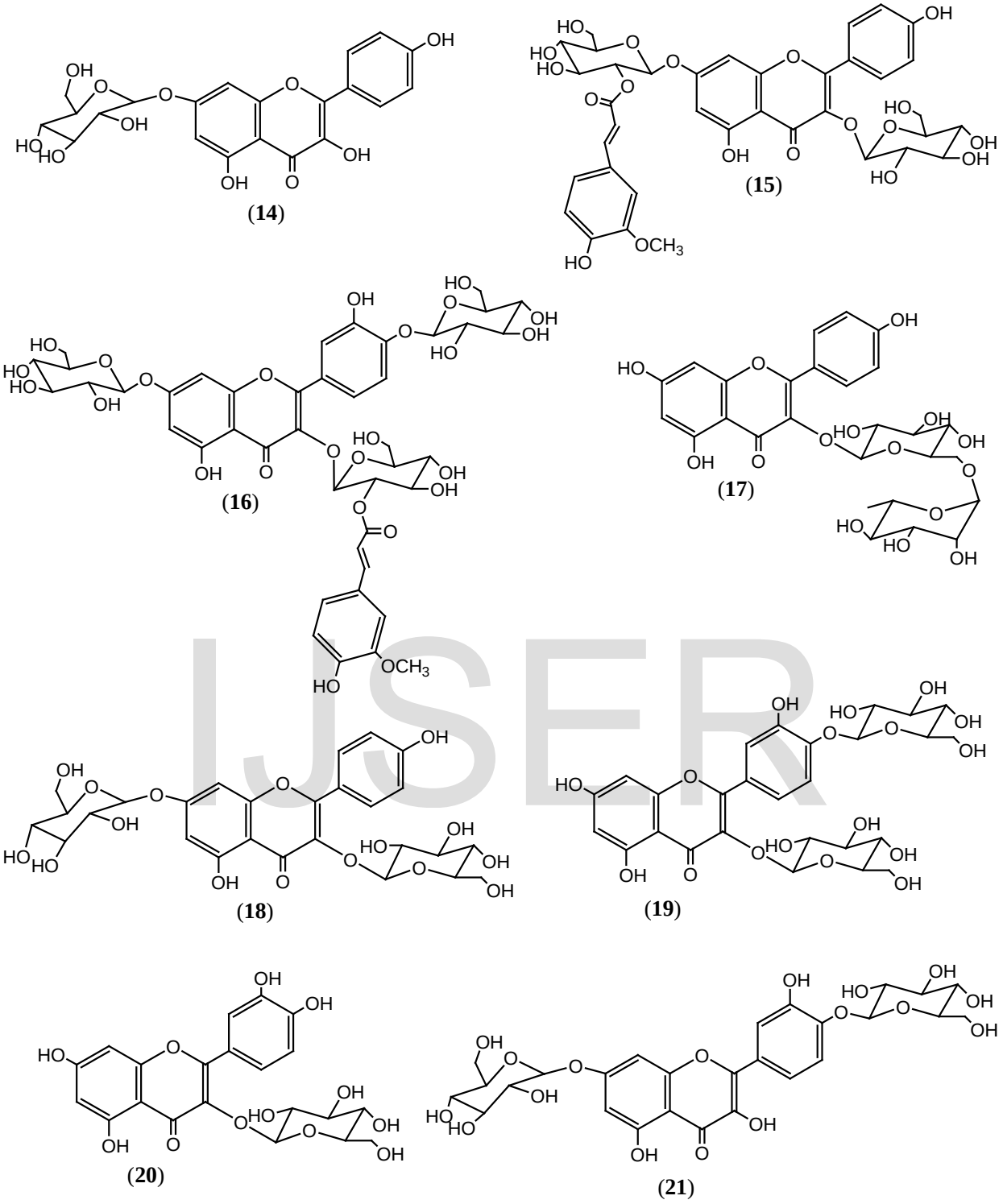


Fig. 1. (*Continued*)



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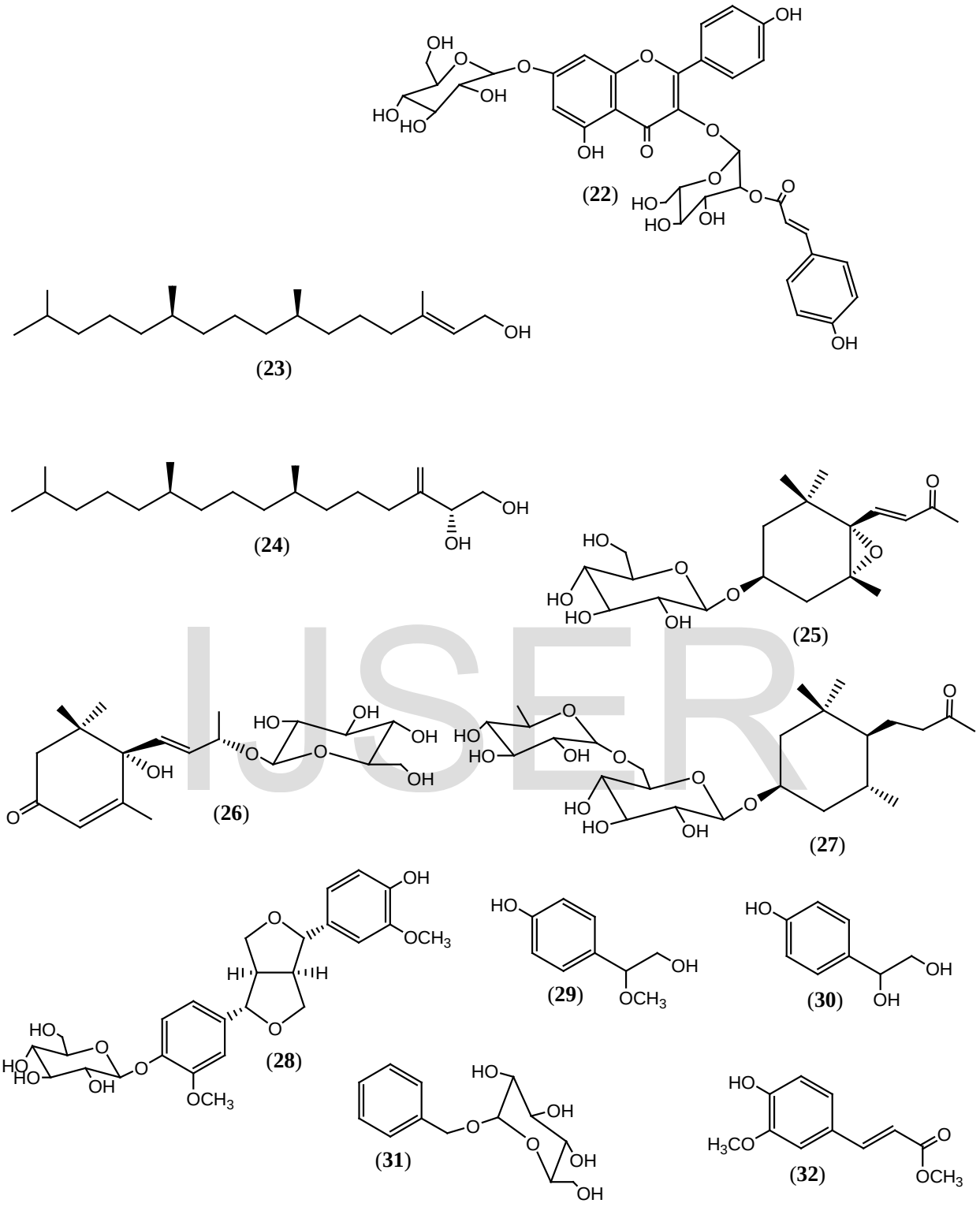

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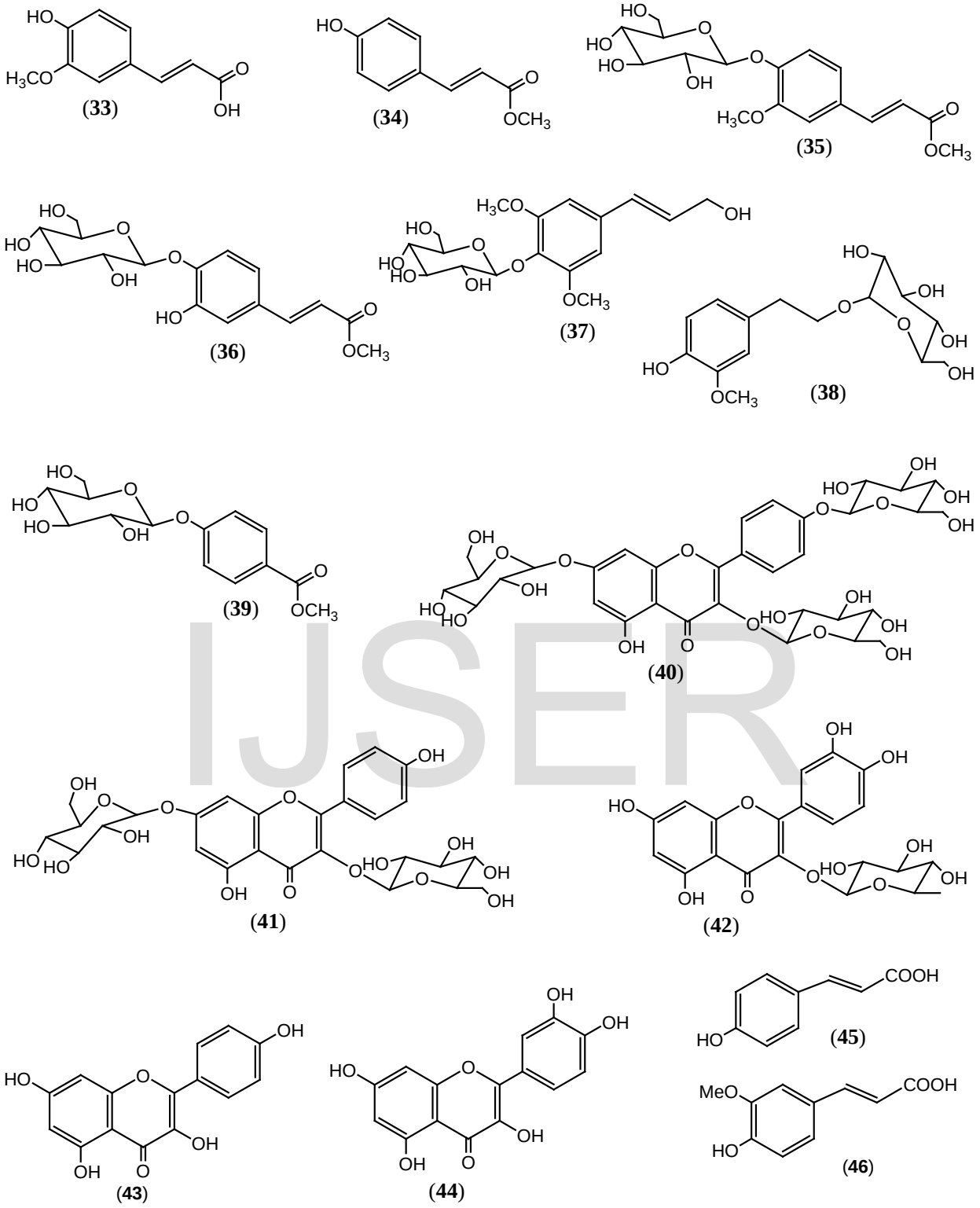

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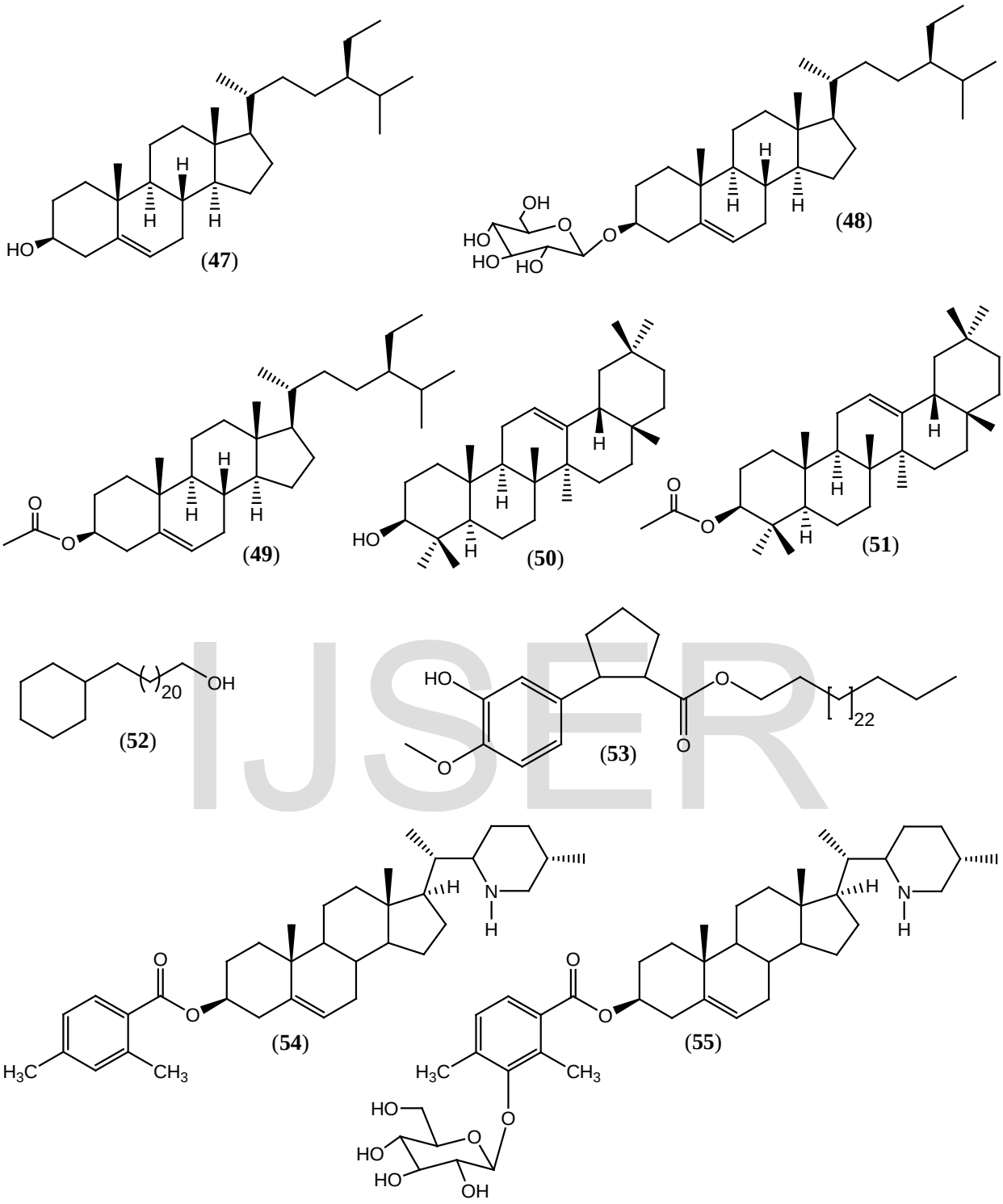

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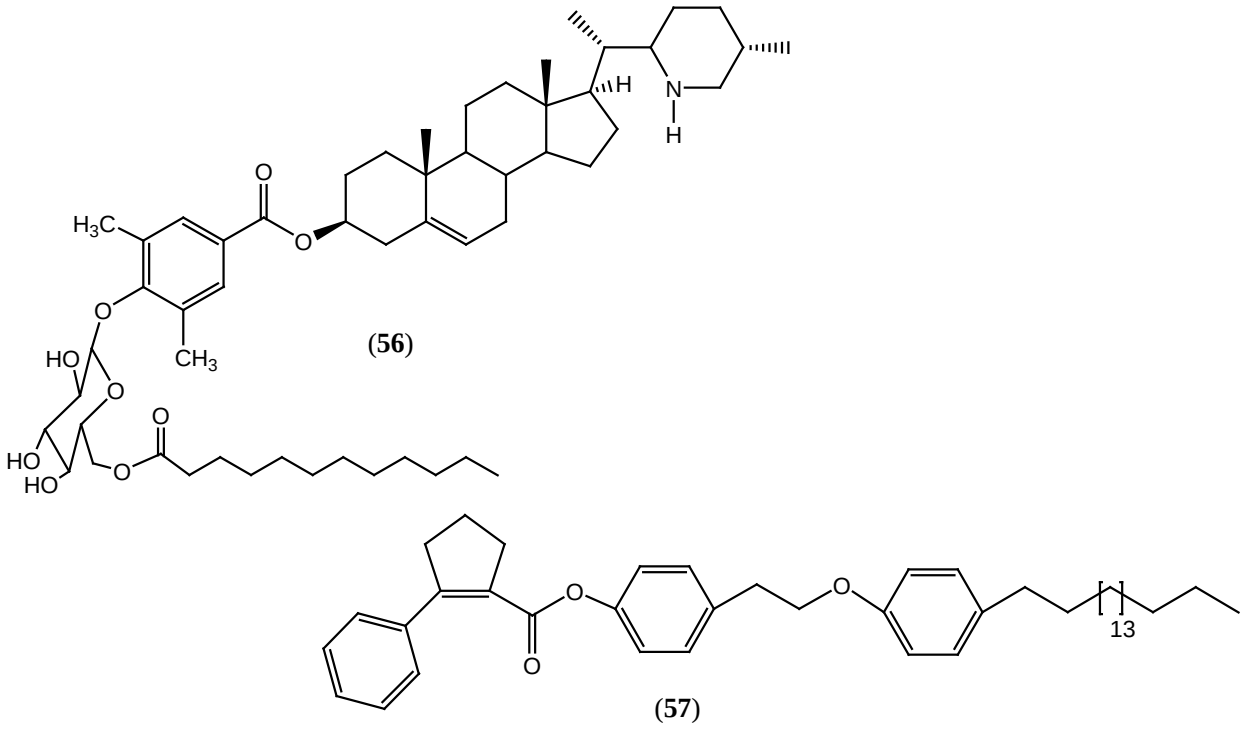

Fig. 1. (*Continued*)

Acknowledgments

All the authors have worked equally in the current article

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