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Review Article (Open access)

A Review of Genus: *Jurinea*

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ABSTRACT- The genus *Jurinea* (*Compositae*) was reviewed for its chemical constituents and biological significance including traditional uses. The genus has been known for its numerous biological activities like antioxidant, antimicrobial, anticholinesterase, antilipid peroxidation, anti-toxic, antileishmanial activity. Most of the plants of this genus are rich sources of sesquiterpene lactones and triterpenes. The bioactive constituents or plants extracts may be uses for treatment of various diseases and these would be used as a new formulation for the novel drugs discovery in pharmaceutical industries.

This review presents comprehensive information on the chemistry and pharmacology of the genus together with the traditional uses of many of its plants. In addition, this review discusses the structure-activity relationship of different compounds as well as recent developments and the scope for future research in this aspect.

Key Words: *Jurinea*, Incence, Sesquiterpene Lactones, Antioxidant, Antibacterial

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1. INTRODUCTION

The plants of the genus *jurinea* (compositae) are widely distributed, and have long been used in folk medicine for the treatment of various ailments such as treatment of colic and puerperal fever, aphrodisiac, gout and rheumatism. A decoction of the root is cordial, it is given in the treatment of colic and puerperal fever and the bruised root is applied as a poultice to eruptions (Chopra *et al.*, 1986). The plant is used in Nepal for incense and the juice of the roots is used in the treatment of fevers (Manandhar, 2002). The limited phytochemical work on *Jurinea* species revealed that their main constituent was the sesquiterpene lactones (Rustaiyan *et al.*, 1981).

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The germacranolides oxygenated at C-14 and C-15are characteristic for this genus (Rustaiyan *et al.*, 1981). This review presents comprehensive information on the chemistry and pharmacology of the genus together with the traditional uses of many of its plants. In the present article, chemical constituents, biological activities and traditional uses of the genus *Jurinea* have been reviewed for the first time.

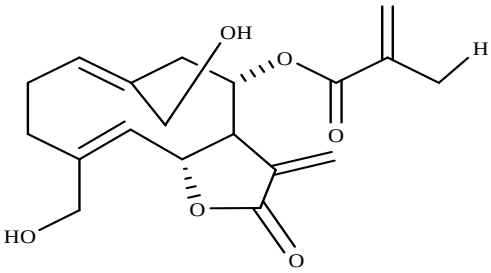
2. TRADITIONAL USES

Jurinea dolomiaea is used in Indian traditional system of medicine. A decoction of the root is cordial, it is given in the treatment of colic and puerperal fever and the bruised root is applied as a poultice to eruptions (Chopra et al., 1986). *Jurinea dolomiaea* is used in Nepal for incense and the juice of the roots is used in the treatment of fevers (Manandhar, 2002). In India *Jurinea dolomiaea* has been used as aphrodisiac (Sekar *et al.*, 2005). In Jammu Kashmir, the plant *Jurinea dolomiaea* is used for treatment of eye infection and aromatic oil from root is useful in gout and rheumatism (Kumar *et al.*, 2009).

3. CHEMICAL CONTITUENTS

3.1. *J. eriobasis*

Germacranolides pectorolide (1), 4-hydroxypectorolide (2), 4'-Hydroxypectorolide-14-O-acetate (3), 1β, 10α-epoxy-4'-hydroxypectorolide-14-O-acetate (4), 4α, β- epoxy-4'- hydroxypectorolide-14-O-acetate (5), alatolide (6) (Rustaiyan et al., 1988).



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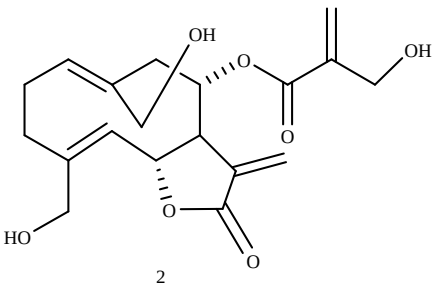

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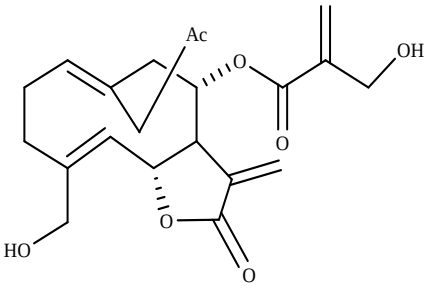

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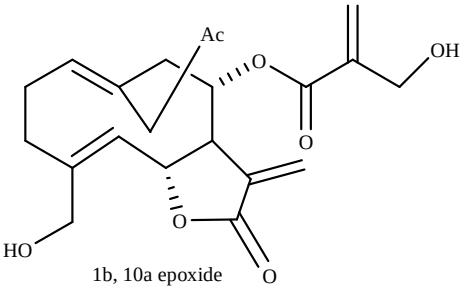

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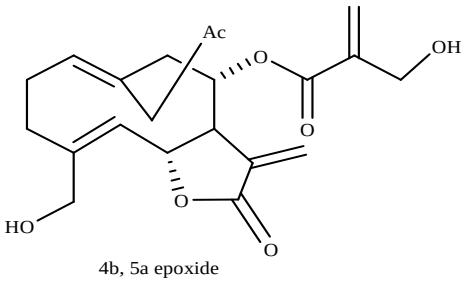

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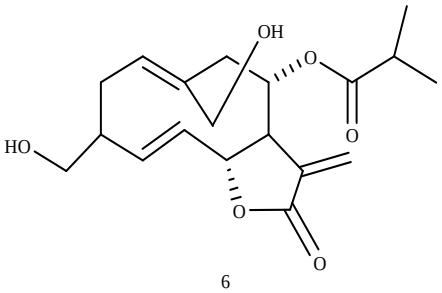

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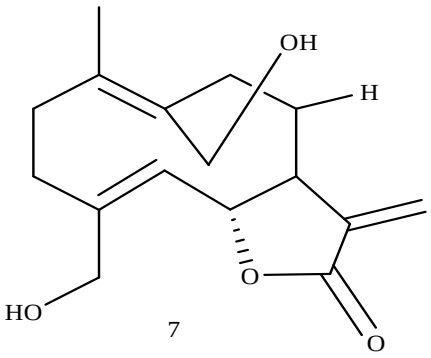
3.2. *J. leptoloba*

Germacranolides (7), germacranolides (8), germacranolides (9), germacranolides (10), germacranolides (11), urospermal A-8-0-angelate (12), urospermal A-8-0-methacrylate (13), urospermol A-8-O-[5-hydroxyangelote] (14), 4E-Urospermal A-8-O-angelate (15), Shirazolide (16), 14-α-O-Dihydroshirazolide (17), l-β-Hydroxy-β-costol-12-O-β-D-glucopyranoside (18), Dihydrosyringenin (19) (Rustaiyan *et al*., 1991).



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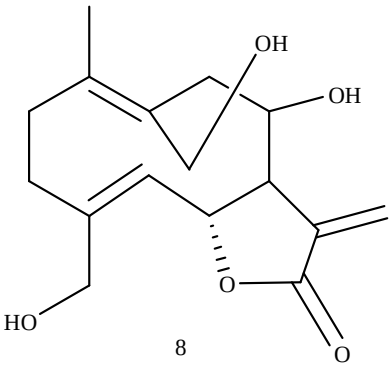

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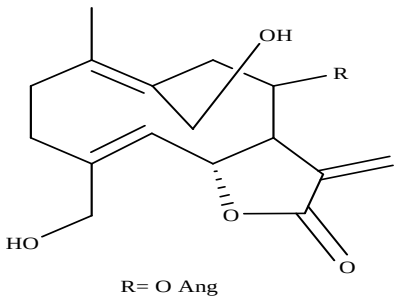

R= O Ang

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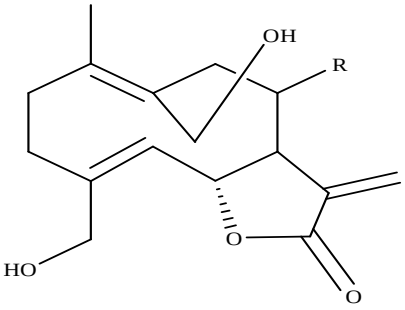

R= O Ang(50 H)

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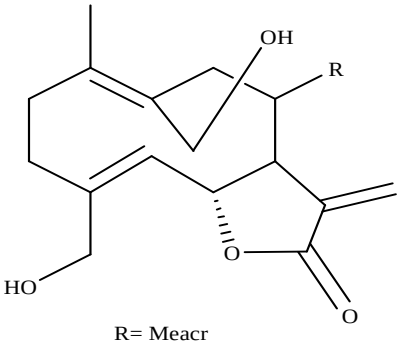

R= Meacr

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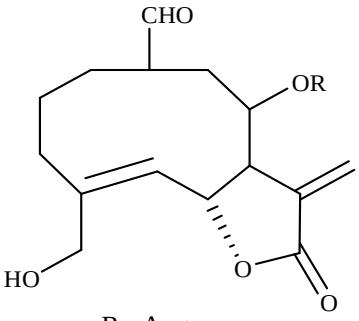

R= Ang

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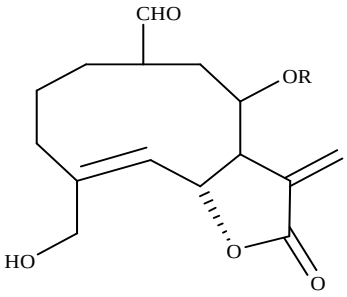

R= Meacr

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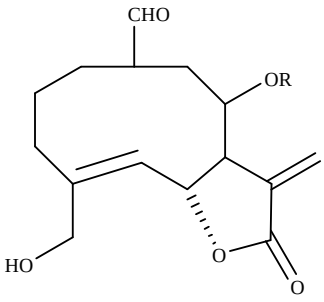

R= Ang (OH)

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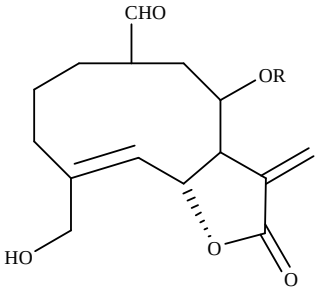

R= Ang 4E

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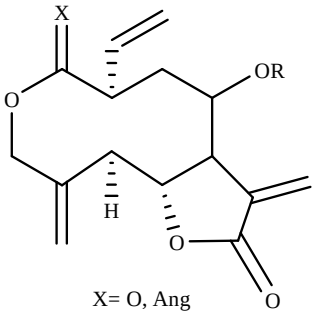

X= O, Ang

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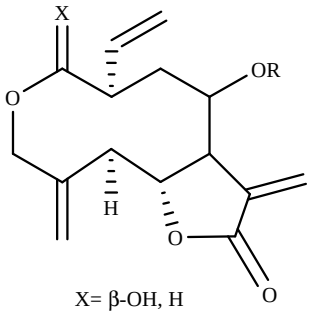
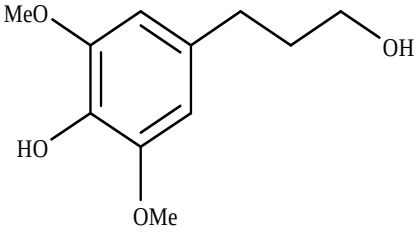


X= β-OH, H

17



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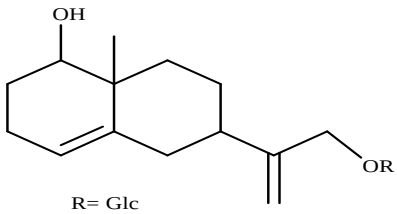

R= Glc

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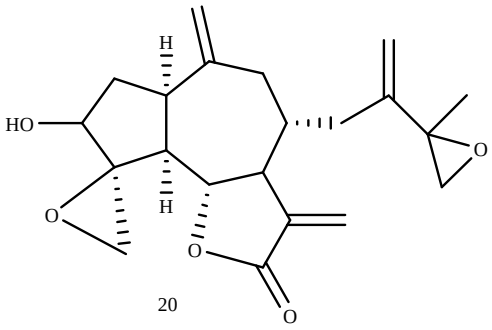
3.3. *J. carduiformis*

Repin (20), janerin (21), R-desacylrepin (22) (Rustaiyan *et al*., 1981).



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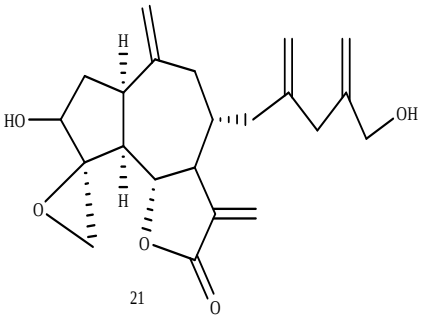

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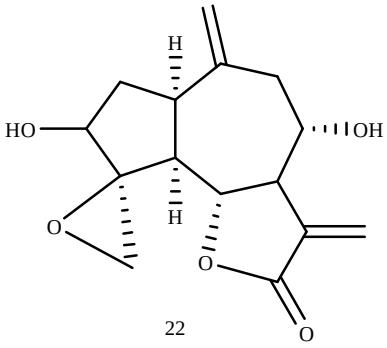

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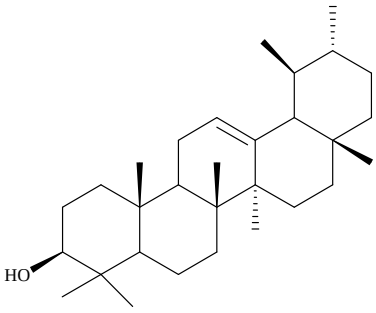
3.4. *J. anatolica*

α- amyrin (23), β-amyrin (24), lupeol (25), taraxasterol (26), φ-taraxasterol (27) (Mikolajczak *et al.*, 1967).



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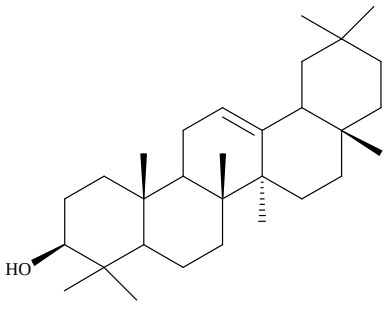

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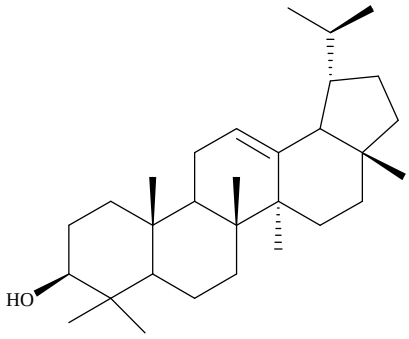

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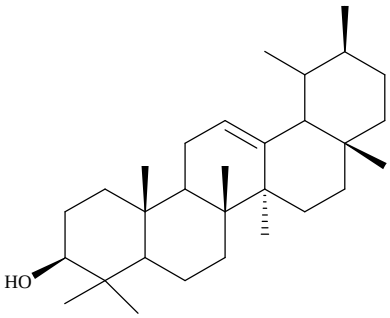

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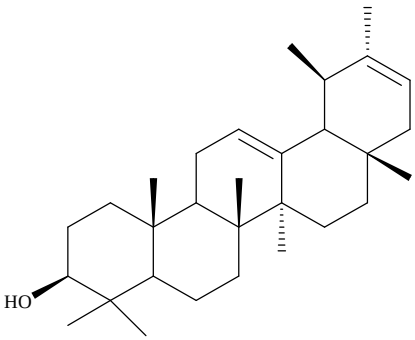

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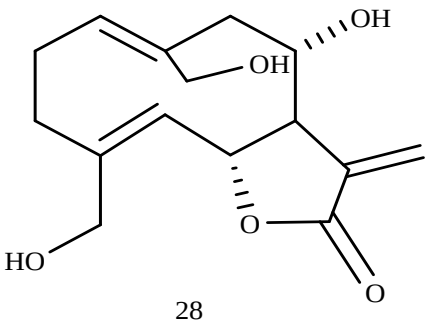
3.5. *J. albicaulis*

Albicolide (28), jurineolide (29), jurineolide triacetate (30), pectorolide (31), 8α-tiglylalbicolide (32), Juricanolide (33), vernolide (34), vernomigdine (35) (Todorova *et al.*, 1984).



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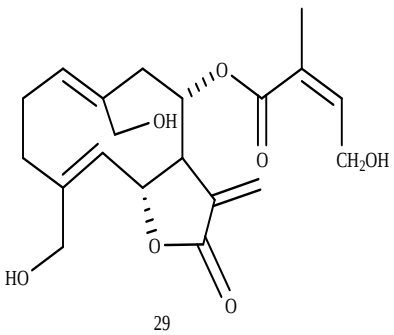

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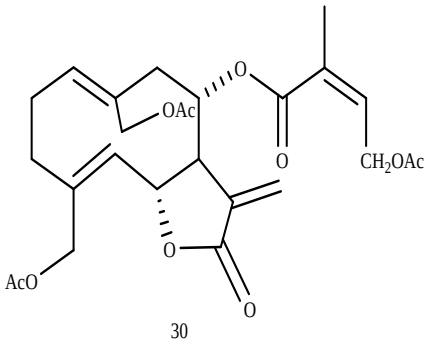

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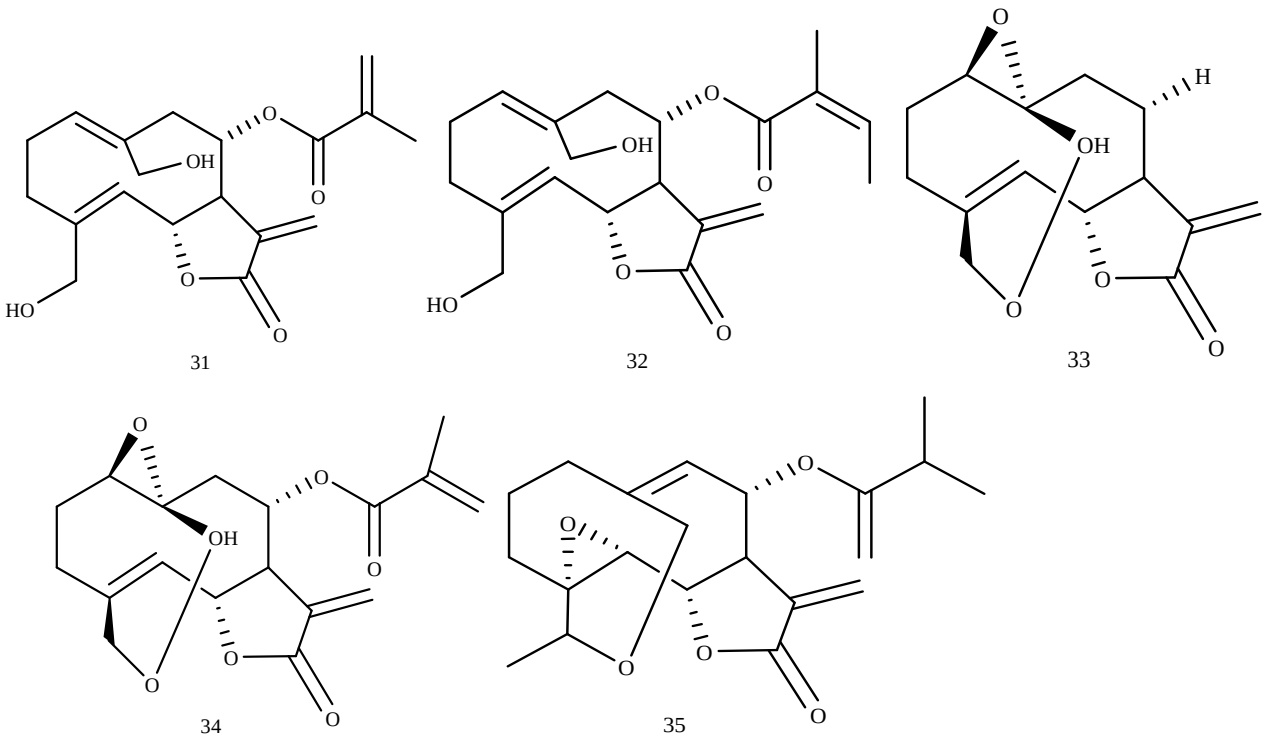

3.6. *J. maxima*

Salonitenolide, salonitolide (Jakirov *et al*., 1975).

3.7. *J. suffruticosa*

Acroptilin, salonitenolide (Jakirov *et al*., 1982).

4. BIOLOGICAL ACTIVITY

4.1. Antileishmanial Activity- Leishmaniasis is an important parasitic problem and is in focus for development of new drugs all over the world. Dry powder of plants was extracted with crude methanol and fractionated with n-hexane, chloroform, ethyl acetate, n-butanol, and water solvents in escalating polarity order. Antileishmanial activity was performed against *Leishmania tropica* KWH23 promastigote. IC50 values of plants studied for anti-leishmanial activity. *Jurinea dolomiaea* ethyl acetate fraction exhibited the best activity in terms of IC50 value (5.3 ± 0.2 μg/ml) comparably low than standard drug Glucantime (5.6 ± 0.25) against *Leishmania tropica* promastigotes. Highest IC50 was expressed by chloroform extract. IC50 values of methanol, ethyl acetate, hexane, and water fall in a range with minor differences. Regression square (R^2) value ranged (0.81–0.9) Potent anti-leishmanial activity was observed for *Jurinea dolomiaea* methanol extract (IC50 = 10.9 ± 1.1 μg/ml) in comparison to other plant extracts. However, *Jurinea dolomiaea* "ethyl acetate fraction" was more active (IC50 = 5.3 ± 0.2 μg/ml) against Leishmania tropica KWH23 among all plant fractions as well as standard Glucantime drug (6.0 ± 0.1 μg/ml) (Shah *et al*., 2014a).

4.2. Anti-Toxic Activity

To estimate the toxicity of the *Jurinea dolomiaea* extracts and fractions, brine shrimp lethality assay was used. For the hatching of brine-shrimps eggs, at three different concentrations of each extract (2500, 500, and 50 μg/ml) were made, taken from 10 mg/ml stock solution in methanol. Methanol was evaporated before transferring shrimps to the vials. Brine shrimp toxicity is an easy and economical in vitro assay to determine toxicity and safety of crude extract. Brine shrimp in vitro assay was performed to evaluate the safety assessment extracts and its derived fractions. Methanol extract showed LC50 of (733.0 ± 15.1 μg/ml). In derived fractions, LC50 ranged from (569.5±7.4 to 1593±20.2 μg/ml). Lowest LC50 was shown by ethyl acetate while higher by water fraction. Regression R^2 ranged 0.92–1.0 (Shah *et al.*, 2014a).

4.3. Antilipid Peroxidation Activity

A mixture of egg yolk (10%, w/v) was prepared in KCl (1.15%, w/v). It was homogenized for 30 sec and subsequently subjected to ultrasonication for 5 min. The IC50 values of anti-lipid per oxidation activity of *Jurinea dolomiaea* extract and its various fractions are give the activity. Minimum IC50 was observed by

ethyl acetate and the highest by hexane with (54.3 ± 1.6) and (2075.0±10.3 μg/ml), respectively. Ethyl acetate < butanol < methanol < chloroform < water < hexane order of IC50 was shown by extract and various fractions. Significant correlation was observed with TFC (R^2 = 0.64, P < 0.05) and non significant with TPC (R^2 = 0.39, P > 0.39). IC50 value of ethyl acetate was comparable with standard but significantly different (Shah *et al.*, 2014b).

4.4. DNA Protection Activity

Plasmid DNA (pBR322 Ferment as) 0.5 μg/3 μl was treated with 5 μl of each sample (100, 50, and 25μg/ml). In pBR322 DNA gel electrophoretic pattern the band with faster movement represents the native form of super coiled plasmid circular DNA and the band moving slower corresponds to the open circular form Crude methanol extract and its fraction ethyl acetate showed no protection against the Fenton reaction induced degradation. Fractions chloroform, water, and hexane showed protection only at high doses. Butanol fraction instead of protection against Fenton reaction showed degrading effect on plasmid DNA at high dose which decreases with drop of concentration (Shah *et al.*, 2014b).

4.5. Antibacterial Activity

The antibacterial activity of different extract of *Jurinea ancyrensis* were investigated by disc diffusion method to using *Bacillus megaterium* DMS 32, *Pseudomonas aeruginosa* DMS 50071 SCOTTA, *Escherichia coli* ATCC 25922, *Klebsiella pneumoniae* FMC 5, *Proteus vulgaris* FMC 1 and *Staphylococcus aureus* COWAN 1 FMC 16. The extracts of plant showed various antimicrobial activities against the microorganism. *Jurinea ancyrensis* showed activity against all microorganisms, with diameters of inhibition zone ranging between 11 and 20 mm. *Jurinea ancyrensis* can be used as antimicrobial agents in development of new drugs for the treatment of infectious disease (Kirbag *et al.*, 2009).

In vitro antibacterial activity of the petroleum ether, chloroform and methanol extracts obtained from the aerial parts of *Jurinea consanguinea*. The strains of bacteria were used *Bacillus subtilis* ATCC 6633, *Klebsiella pneumoniae* ATCC 33495, *Proteus vulgaris* ATCC 13315, *Pseudomonas aeruginosa* ATCC 27853, *Staphylococcus aureus* ATCC 25923. The inhibition zones of disc for strains were in the ranges 8.0-15.0 mm. The petroleum ether, chloroform and methanol extracts were found to be inactive against Gram negative bacteria, *K. pneumoniae* and *P. vulgaris*, and chloroform extract showed moderate activity against *B. subtilis*, *P. aeruginosa* and *S. aureus*. The methanol extract exhibited almost the same activity with the chloroform extract against *P. aeruginosa*. When comparing the antibacterial activity of the tested extracts to that of reference antibiotic, ofloxacin, their inhibitory potency was not found to be significant (Ozturk H et al., 2011). Antibacterial activity of aqueous extract and solvent extracts (methanol, ethanol, ethyl acetate and chloroform) from *Jurinea dolomiaea* leaves was determined by disc diffusion method on nutrient agar medium, against clinical bacteria (*Escherichia coli* and *Staphylococcus aureus*) and phytopathogenic bacteria (*Xanthomonas vesicatoria* and *Ralstonia solanacearum*). Methanol extract of which offered inhibition zone of 10, 9, 12 and 12 mm against *E. coli*, *S. aureus*, *X. vesicatoria* and *R. solanaccearum*, respectively, followed by chloroform extract of the same plant leaf with inhibition zone of 8, 4, 4 and 4 mm, respectively. The minimum inhibitory concentration (MIC) value for the clinical bacteria ranged between 0.35 to 4.0 mg/ml and 0.25 to 4.0 mg/ml for phytopathogenic bacteria when tested with all four solvents extracts of *J. dolomiaea* (Dwivedi *et al*., 2014).

4.6. Antifungal Activity

The antifungal activity of plant *Jurinea ancyrensis* extract, evaluated according to the disk diffusion method by using *Candida albicans* FMC 17, *Candida glabrata* ATCC 66032 and *Candida tropicalis* ATCC 13803. *Jurinea ancyrensis* showed activity against all the fungal strains, with diameters of inhibition zone ranging between 17-20 mm. *Candida albicans* FMC 17 have the highest efficiency (inhibition zone 20 mm) (Kirbag S et al., 2009).

4.7. Anticholinesterase Activity

Anti-cholinesterase activities of the petroleum ether, chloroform and methanol extracts obtained from the aerial parts of *Jurinea consanguinea*. Acetyl and butyryl-cholinesterase inhibitory activities were measured, by slightly modifying the spectrophotometric method. Electric eel AChE and horse serum BChE were used, while acetylthiocholine iodide and butyrylthiocholine iodide were employed as substrates of the reaction. DTNB (5, 5-dithio-bis (2-nitrobenzoic) acid) were used for the measurement of the cholinesterase activity. Highest inhibition percentage (24-28 % inhibition) against the enzyme acetylcholinesterase was observed for the petroleum ether extract of *Jurinea consangui-*

nea, it showed the least inhibition against the enzyme butyrylcholinesterase. While the chloroform extract exhibited higher inhibition than a reference compound, galantamine, at 25 and 50 µg/ml, the methanol extract showed higher butyrylcholinesterase inhibitory activity than galantamine at all concentrations (94% inhibition at 200 µg/ml) (Ozturk *et al.,* 2011).

4.8. Antioxidant Activity

The petroleum ether, chloroform and methanol extracts from the aerial parts of *Jurinea consanguinea* were screened for their antioxidant activity by two complementary methods, β-carotene bleaching and DPPH free radical scavenging assays. The β-carotene-linoleic acid system and DPPH free radical scavenging assay were carried out at four different concentrations. Petroleum ether and chloroform extracts exhibited over 50% inhibition of lipid peroxidation by β- carotene bleaching method at 200µg/ml they were found to be inactive at all concentrations in DPPH free radical scavenging assay. While the methanol extract possessed almost the same effect with the chloroform extract in β-carotene bleaching method at all concentrations, it exhibited higher free radical scavenging activity than a standard compound, BHT, at 100 and 200µg/ml. In the DPPH Methods methanol extract show maximum inhibition compare to her extract (Ozturk H et al., 2011).

Methanol extract of plant *Jurinea dolomiaea* was fractionated into n-hexane, chloroform, ethyl acetate, butanol, and aqueous fractions and determine the antioxidant activity by different methods (DPPH radical scavenging activity, hydrogen peroxide scavenging activity, hydroxyl radical scavenging activity, ABTS radical cation scavenging activity, antilipid peroxidation activity, β-Carotene bleaching activity, superoxide anion radical scavenging activity and nitric oxide radical scavenging activity). The DPPH method best IC50 was shown by ethyl acetate (41.1 ± 1.0 μg/ml) followed by butanol (132.9 ± 2.1 μg/ml), while the highest IC50 value was shown by aqueous. IC50 of ethyl acetate was comparable to positive control (ascorbic acid) IC50 but significantly different. In the hydrogen peroxide scavenging, Ethyl acetate showed the lowest IC50 of (42.2±0.9 μg/ml) against hydrogen peroxide, followed by butanol < chloroform < aqueous < methanol < n-hexane. IC50 of ethyl acetate fraction was significantly lower than ascorbic acid hydroxyl radical scavenging activity. The lowest IC50 values were shown by ethyl acetate and butanol (47.4 ± 3.3) and (77.0 ± 3.5 μg/ml), while the highest was observed for n-hexane (385.0 ± 7.4 μg/ml). The best ABTS radical was shown by ethyl acetate (46.7 ± 0.6 μg/ml) while lowest by n-hexane (568.0±4.1 μg/ml). IC50 of ethyl acetate was significantly lower than ascorbic acid. Results expressed the concentration dependent activity of all the tested samples. The IC50 values of antilipid peroxidation activity of *Jurinea dolomiaea* extract, Minimum IC50 was observed by ethyl acetate and the highest by n-hexane with (54.3 ± 1.6) and (2075.0±10.3) μg/ml. β-carotene bleaching activity of the *jurinea dolomiaea* Fraction ethyl acetate and butanol showed the lowest IC50 values (82.8 ± 0.6) and (86.5 ± 1.1) μg/ml The lowest activity was observed by aqueous fraction (267.4 ± 1.3 μg/ml). *Jurinea dolomiaea* as well as all its fractions recorded good superoxide radical scavenging activity. The highest activity was observed from chloroform (91.7 ± 1.3 μg/ml) and the lowest from aqueous (497.8 ± 4.2 μg/ml). In the nitric oxide activity the lowest IC50 value was recorded by chloroform (92.0 ± 1.0 μg/ml) while the highest by n-hexane (781.9±4.3 μg/ml). Overall, order of chloroform < ethyl acetate < methanol < aqueous < butanol < n-hexane was observed. IC50 of chloroform is higher than positive control but comparable (Shah *et al*., 2014b).

5. CONCLUSION

It is quite evident from literature that plants of the genus *Jurinea* are potent remedies for various ailments in traditional systems of medicine worldwide. Among them, many plants are neither investigated chemically nor scientifically evaluated for their respective activities. Moreover, a majority of constituents and plant extracts from this genus have not yet been investigated for their biological activity. Therefore, an extensive research is required to find out the biological activity and mechanism action of such constituents. Furthermore, the chemically unknown species may become a source of novel drugs; therefore, a detailed chemical analysis is required to isolate bio-active constituents from them and to trace out their biological activities. Thus, it can be concluded that the genus *Jurinea* can play an important role in modern medicinal system in the near future.

REFERENCES

[1] Chopra RN, Nayar SL, Chopra IC (Glossary of Indian Medicinal Plants) (Including the Supplement), *Council of Scientific and Industrial Research, New Delhi,* 1986.

[2] Manandhar NP (Plants and People of Nepal Timber Press), 2002, Oregon.

[3] Rustaiyan A., Niknejad A., Bohlmann F., Schuster A, *Phytochem*, 1981, 20, 1154.

[4] Sekar KC, Srivastava SC., *Ethanobot*, 2005, 17, 189-190.

[5] Kumar M., Paul Y., Anand VK (An Ethanobotanical Study of Medicinal Plants Used by ths local in Kistwar, Jammu and Kashmir, India, Ethanobot) *Leaflet*, 2009, 13:1240-1256.

[6] Rustaiyan A., Saberi M., Habibi Z., Jakupovic J, *Phytochem*, 1991, 30, 6, 1929-1932.

[7] Mikolajczak KL, Smith CR., (1967), Lipids, 2, 2, 127. Naithani BD., (1984), Flora of Garhwal, Botanical Survey of India, 1, 311.

[8] Todorova M., Ognyanov I, *Planta Medica*, 1984, 50, 452-453.

[9] Jakirov SK, Kasymov SZ, Sidyakin GP. *Chemistry of Natural Compounds*, 1975, 11(5): 690.

[10] Jakirov SK., Kasymov SZ., Sidyakin GP (Chemistry of Natural Compounds), 1982, 18(3): 370.

[11] Shah NA., Khan MR., Nadhman A, *BioMed Research International*, 2014, ID 384204.

[12] Shah NA., Khan MR., Naz K., Khan MA, *BioMed Research International*, 2014, ID 726241.

[13] Kirbag S., Zengin F., Kursat M., *Pak. J. Bot*, 2009, 41(4):2067-2070.

[14] Dwivedi SD, Wagay SA. Chemical and Process engineering Research, 2014, 24:9-13.

[15] Ozturk H., Kolak U., Meric C, *Res. Nat. Pro*, 2011, 5(1):43-51.