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Secondary Metabolites from Some Species of *Albizzia*: A Review

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Abstract

This review covers the secondary metabolites reported from five species of *Albizzia*. A total of fifty chemical constituents have been documented from *A. anthelmintica*, *A. chinensis*, *A. julibrissin*, *A. lebbeck* and *A. myriophyla*. Most of the phytoconstituents have been reported from *A. julibrissin* and *A. lebbeck*.

Key words: Secondary metabolites, *Albizzia anthelmintica, Albizzia chinensis, Albizzia julibrissin, Albizzia lebbeck, Albizzia myriophyla*

Introduction

The genus *Albizzia* belongs to the family Leguminosae consisting of 150 species that are widely distributed all over the world (Ghaly *et al.*, 2010). *A. anthelmintica* is a throny medium canopied tree growing to 8m height with smooth bark and open spine-tipped twigs. *A. chinensis* (Bengali name: chakua, amlukia) is an evergreen tree with a flat spreading crown, 30m height with dark gray bark (Orwa *et al.*, 2009). *A. julibrissin* is a small tree growing upto 5-16 m tall with araching branches, dark greenish grey bark for each plant and bipinnate leaves. *A. lebbeck* (Bengali name: Shirish or kalo koroi) is a tall tree that are 12-21 m high and grows all over Bangladesh. The flowers of this plant are useful in asthma and snake bite. The leaves are used in the treatment of blindness and syphilis. The bark is used in inflammation, toothache and leprosy. Having astringent property, the root is helpful in opthalmia and skin diseases (Hussain *et al.*, 2008; Kirtikar and Basu, 1980; Rashid *et al.*, 2003).

A. myriophyla is also a small tree having 4 m height with dark brown young shoots and bipinnate leaves (Orwa *et al.*, 2009). Previous phytochemical studies on the genus of *Albizzia* revealed the occurrences of various natural products such as alkaloids (Dixit and Mitra, 1997), glycosides (Varshney, 1976), terpenoids, steroids and saponins (Pal *et al.*, 1995), anthraquinines and phenolics (Deshpande and Shastri, 1977), triterpenoids, diterpenoids, lignans, and pyridineglycosides (Ghaly *et al.*, 2010)

Results

Secondary metabolites: A total of 50 secondary metabolites have been reported from five species of *Albizzia* (*A. anthelmintica, A. chinensis, A. julibrissin, A. lebbeck* and *A. myriophyla*) as mentioned in table 1 and figure 1.

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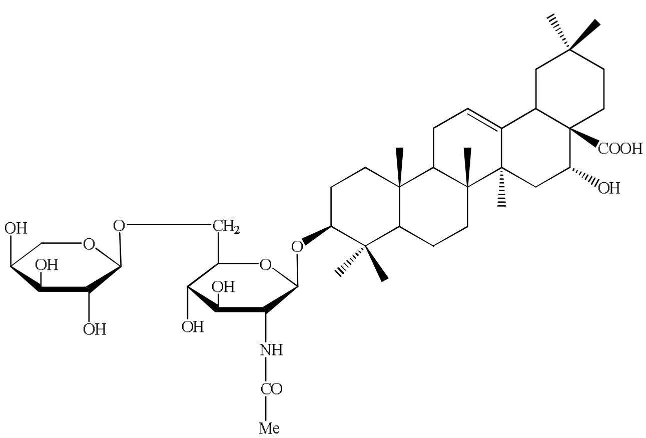
Table 1. Reported secondary metabolites from *Albizzia* species.

Species	Secondary metabolites
A. anthelmintica	3-O-[L-arabinopyranosyl (1→6)]-2-acetamido-2-deoxy-*β*-D-Glucopyranosyl echinocystic acid (**1**) (Carpani *et al.*, 1989).
A. chinensis	Kaempferol 3-*O*-α-L-rhamnopyranoside (**2**), Quercetin 3-*O*-α-L-rhamnopyranoside (**3**), Luteolin (**4**), Kaempferol (**5**), Quercetin (**6**) (Ghaly *et al.*, 2010), α-Amyrin (**7**), β-sitosterol (**8**), 7,3-dimethoxyluteolin (**9**) (Rashid *et al.*, 2014; Sharmin *et al.*, 2014).
A. julibrissin	Quercitrin (**10**), Isoquercitrin (**11**) (Kang *et al.*, 2000), (6*R*)-menthiafolic acid-6-O-*β*-D-quinivoside (**12**), (6*S*)-menthiafolic acid-6-O-*β*-D-quinivoside (**13**), Julibroside J_{28} (**14**), Julibroside III (**15**), Julibroside J_{14} (**16**) (Liang *et al.*, 2005; Zou *et al.*, 2005), (6*S*)-menthiafolic acid-6-O-β-D-xyloside (**17**), Julibroside J_{29} (**18**), Julibroside J_{30} (**19**), Julibroside J_{31} (**20**), Prosapogenin-10 (**21**), Prosapogenin-8 (**22**) (Zheng *et al.*, 2006), Julibroside J_5 (**23**), Julibroside J_8 (**24**), Julibroside J_{12} (**25**), (Zou *et al.*, 2005), Julibroside J_1 (**26**), Julibroside J_9 (**27**), (6*R*)-menthiafolic acid-6-O-*β*-D-quinoside (**28**), (6*S*)-menthiafolic acid-6-O-*β*-D-quinoside (**29**), [(2*E*, 6*R*)-2,6-Dimethyl-6-hydroxy-2,7-octadienoic acid-6-O-β-xyloside (**30**)] (Zou *et al.*, 2000), *cis*-p-Coumaroylagmatine (**31**) (Ngano *et al.*, 2003; Ueda *et al.*, 1999; Ueda *et al.*, 1997), Potassium *β*-D-glucopyranosyl 11-hydroxyjasmonate (**32**), Potassium *β*-D-glucopyranosyl tuberonate (**33**), Jasmonic acid (**34**) (Ueda *et al.*, 1999).
A. lebbeck	Lupeol (**35**), Stigmasterol (**36**), 4-Hydroxy-3-methoxycinnamic acid (**37**), *trans*-*p*-coumaric acid (**38**) (Hussin *et al.*, 2008), 3´,5-Dihydroxy-4´,7-dimethoxy flavones (**39**), *N*-benzoyl-L-phenylalaninol (**40**) (Rashid *et al.*, 2003), Albigenin (**41**), Lebbekanin A (**42**), Lebbekanin E (**43**), Melacacidin (**44**), (-)-2,3-*cis*-3,4-*cis*-3-*O*-methyl melacacidin (**45**), Melanoxetin (**46**), 3´-*O*-methylmelanoxetin (**47**) (Une *et al.*, 2001).
A. myriophyla	Albizzioside A (**48**), Albizzioside (**49**), Albizzioside (**50**) (Ito *et al.*, 1994).



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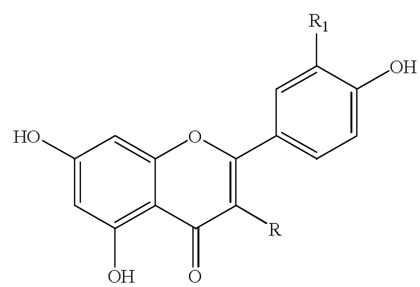
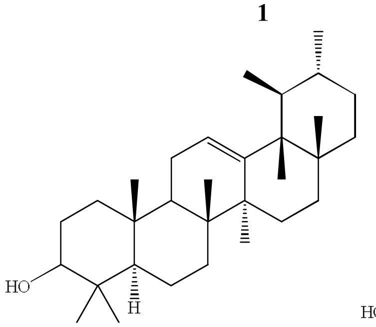


2: R = O-alpha-L-rhamnopyranosyl, R_1 = H
3: R = O-alpha-L-rhamnopyranosyl, R_1 = OH
4: R = H, R_1 = OH
5: R = OH, R_1 = H
6: R = OH, R_1 = OH



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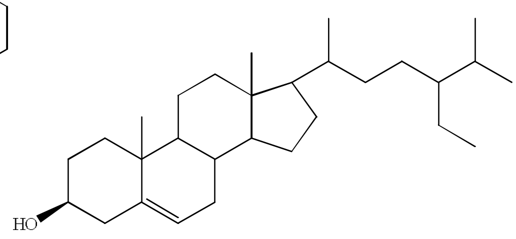

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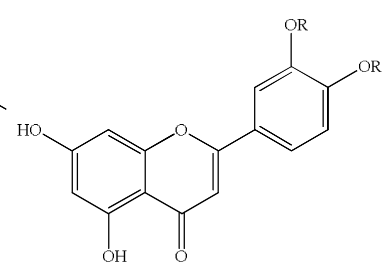

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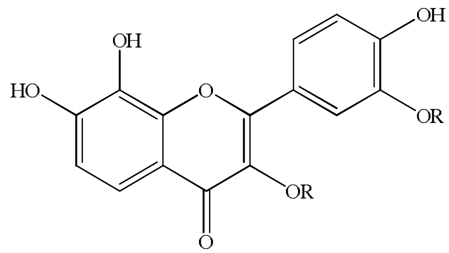
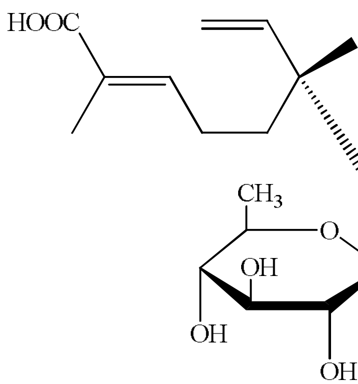


10: R = Alpha-L-rhamnopyranose
11: R = Beta-D-glucopyranose



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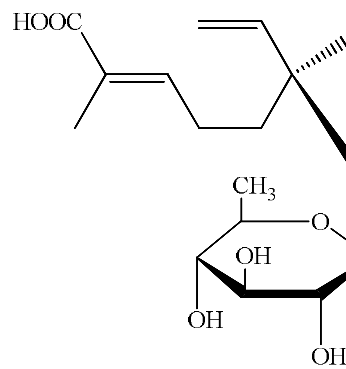

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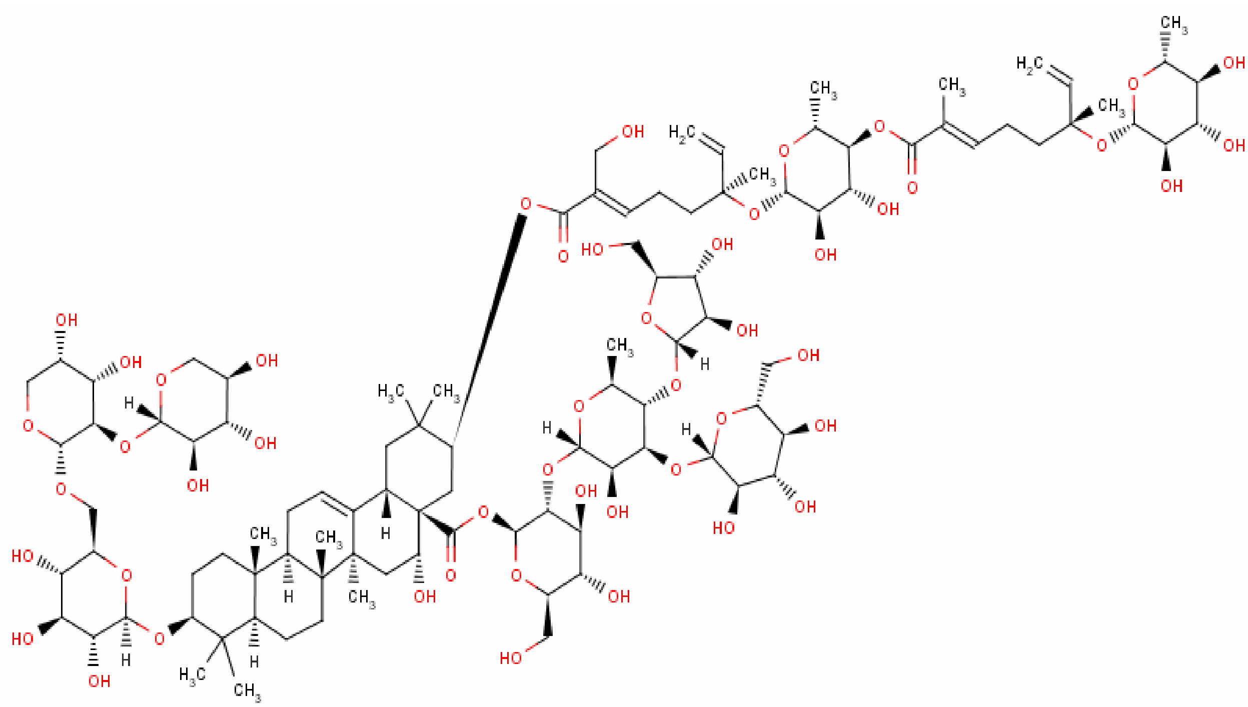

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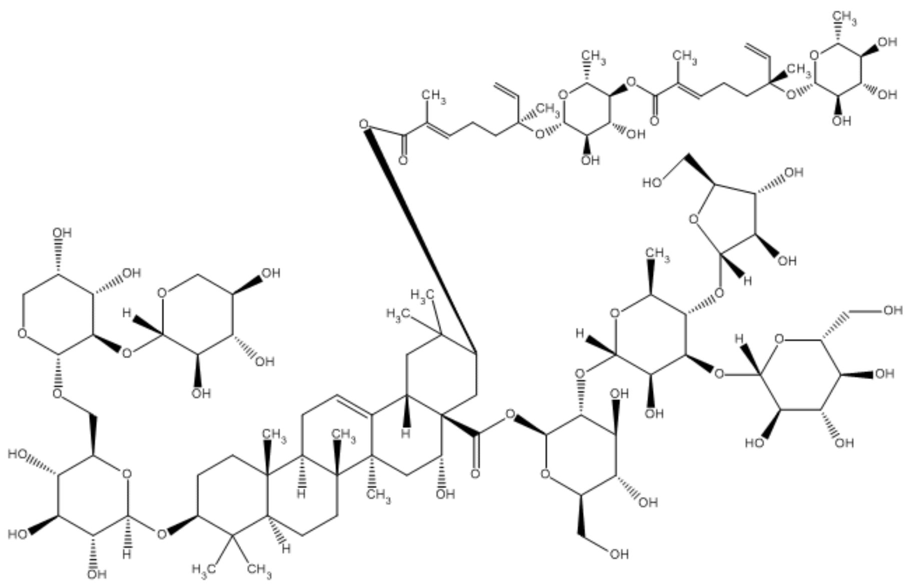

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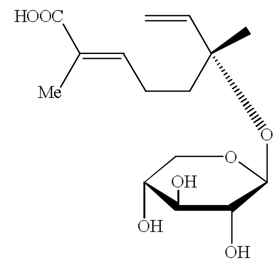

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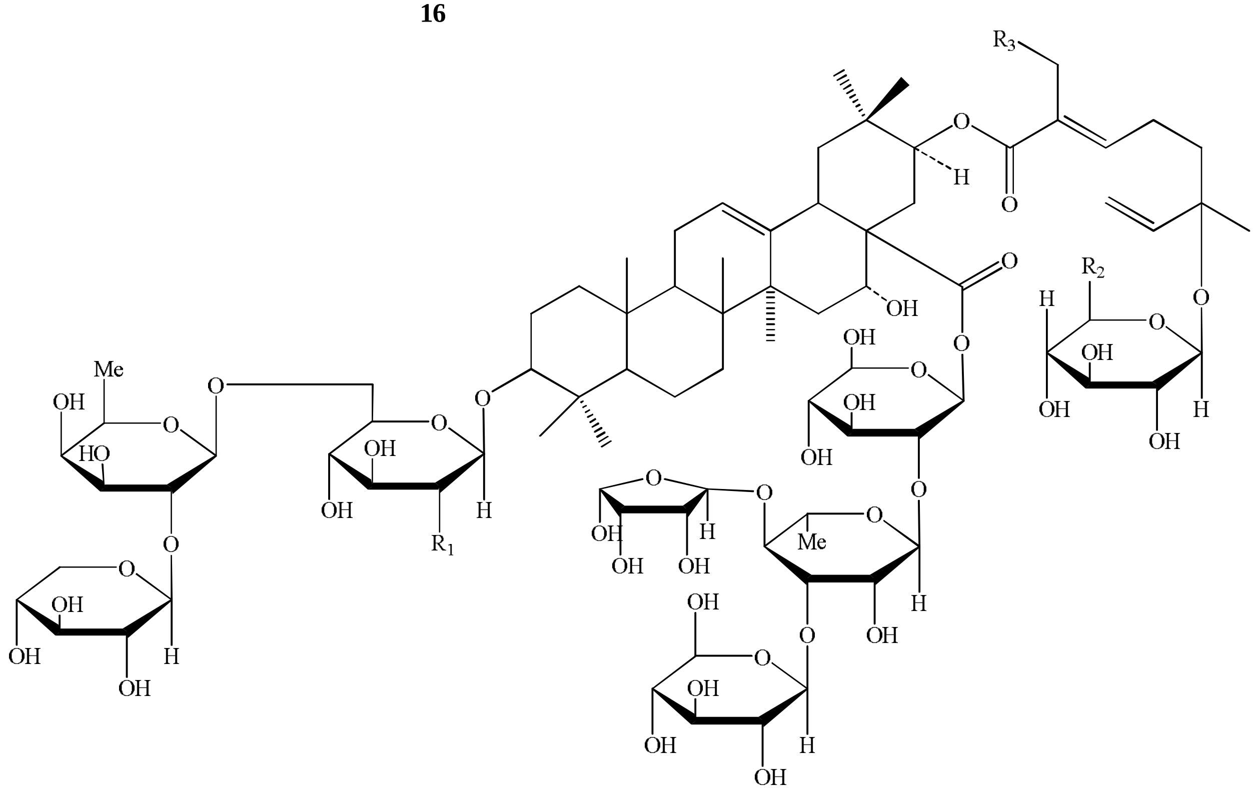
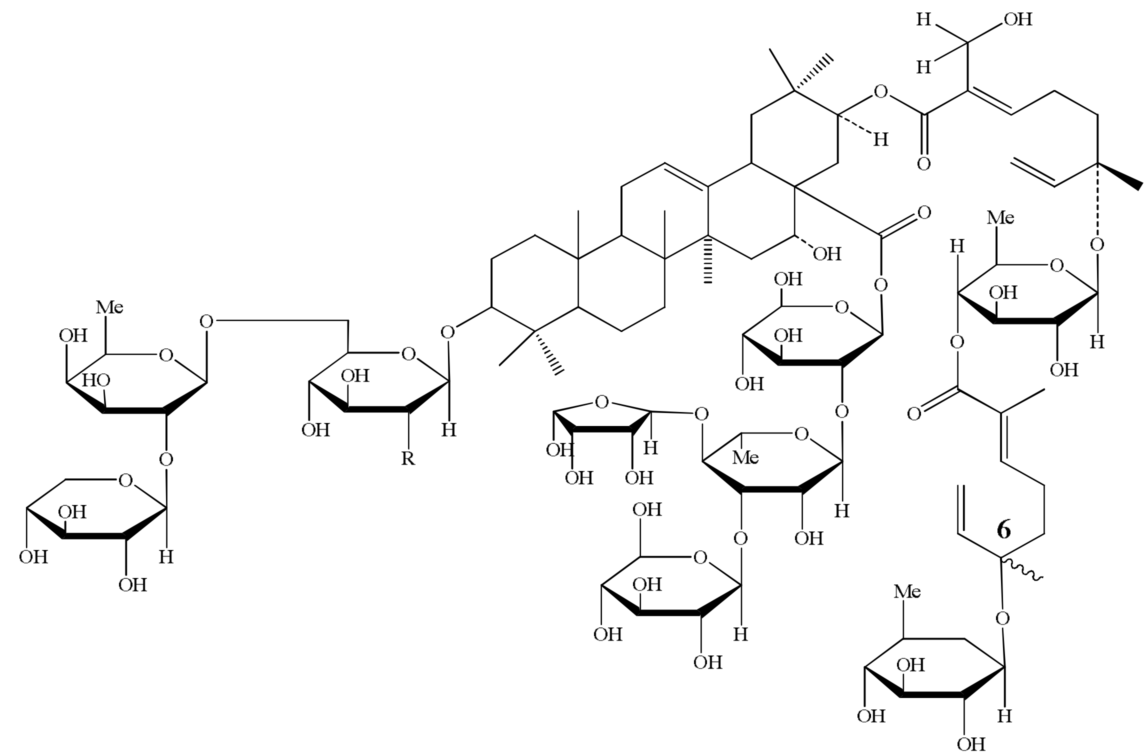
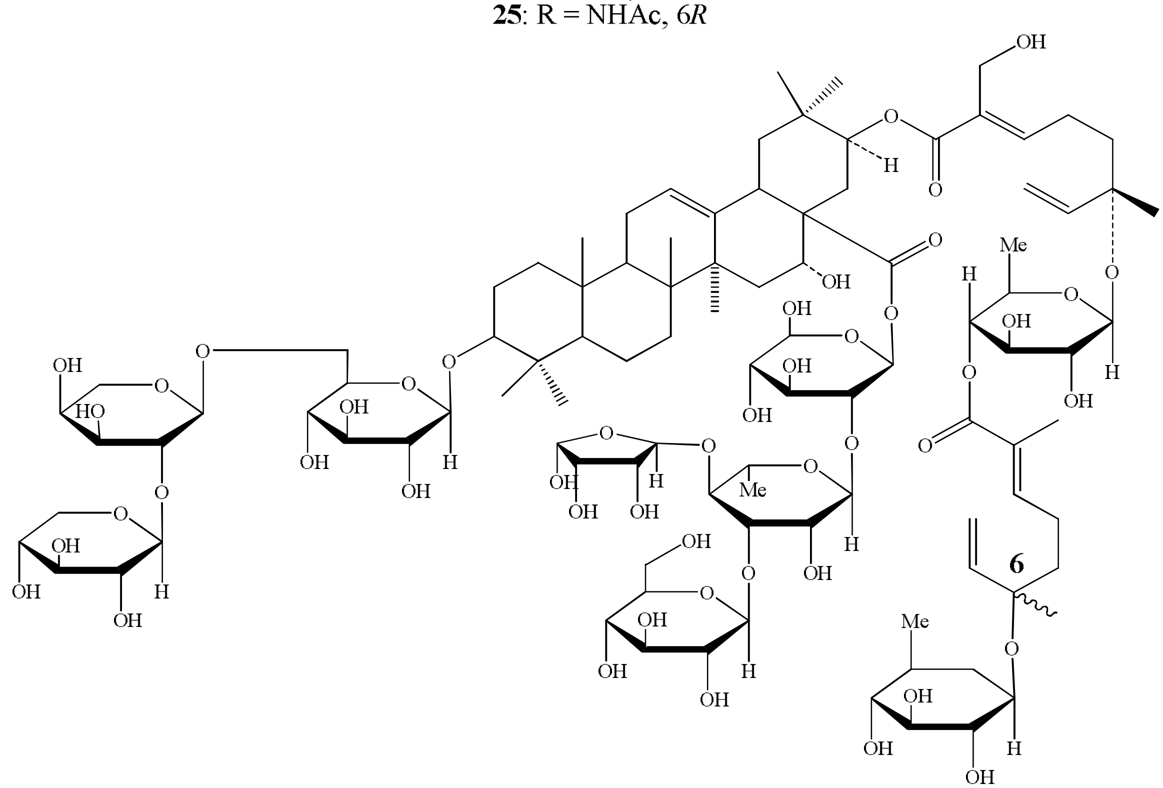


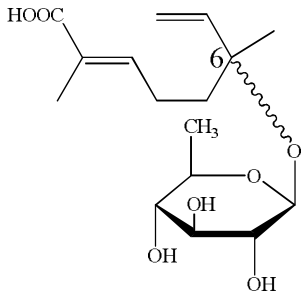
18: R_1 = NHAc, R_2 = Me, R_3 = OH
19: R_1 = NHAc, R_2 = H, R_3 = OH
20: R_1 = O-glc, R_2 = Me, R_3 = OH
21: R_1 = OH, R_2 = Me, R_3 = OH
22: R_1 = O-glc, R_2 = Me, R_3 = H



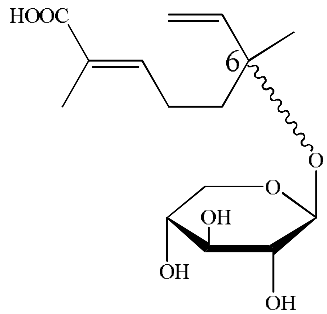
23: R = OH, 6*R*
24: R = OH, 6*S*
25: R = NHAc, 6*R*



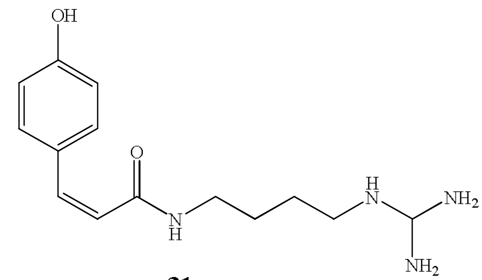
26: C-6 = *R*
27: C-6 = *S*



28: C-6 = *R*
29: C-6 = *S*



30: C-6 = *R*



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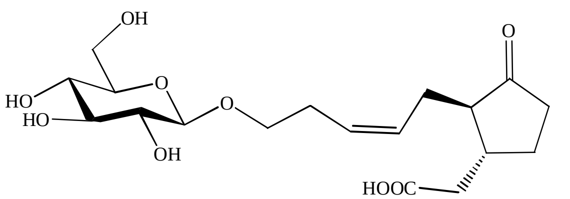

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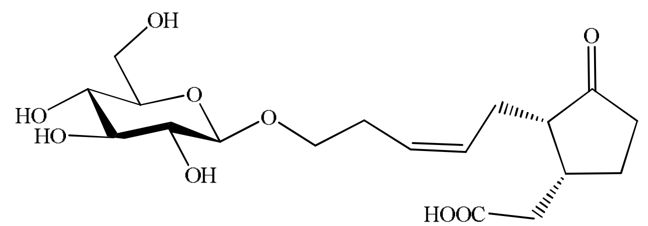

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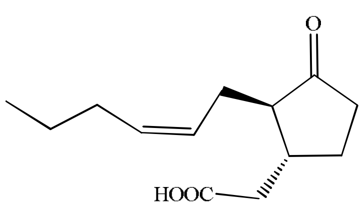

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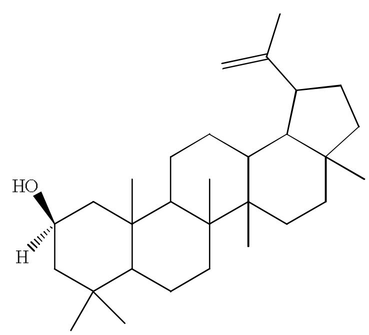

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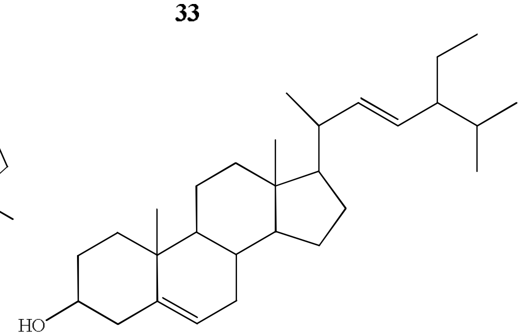

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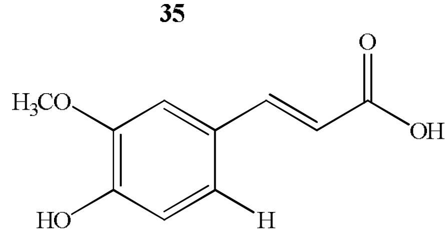

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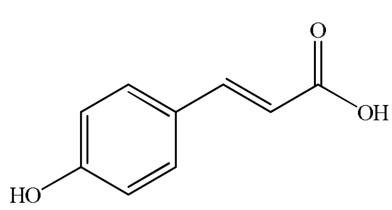

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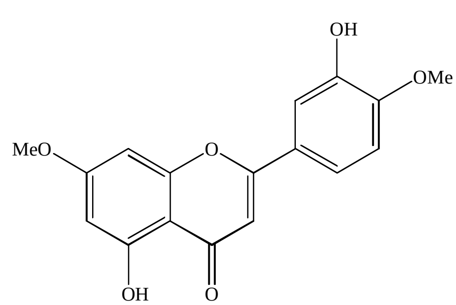

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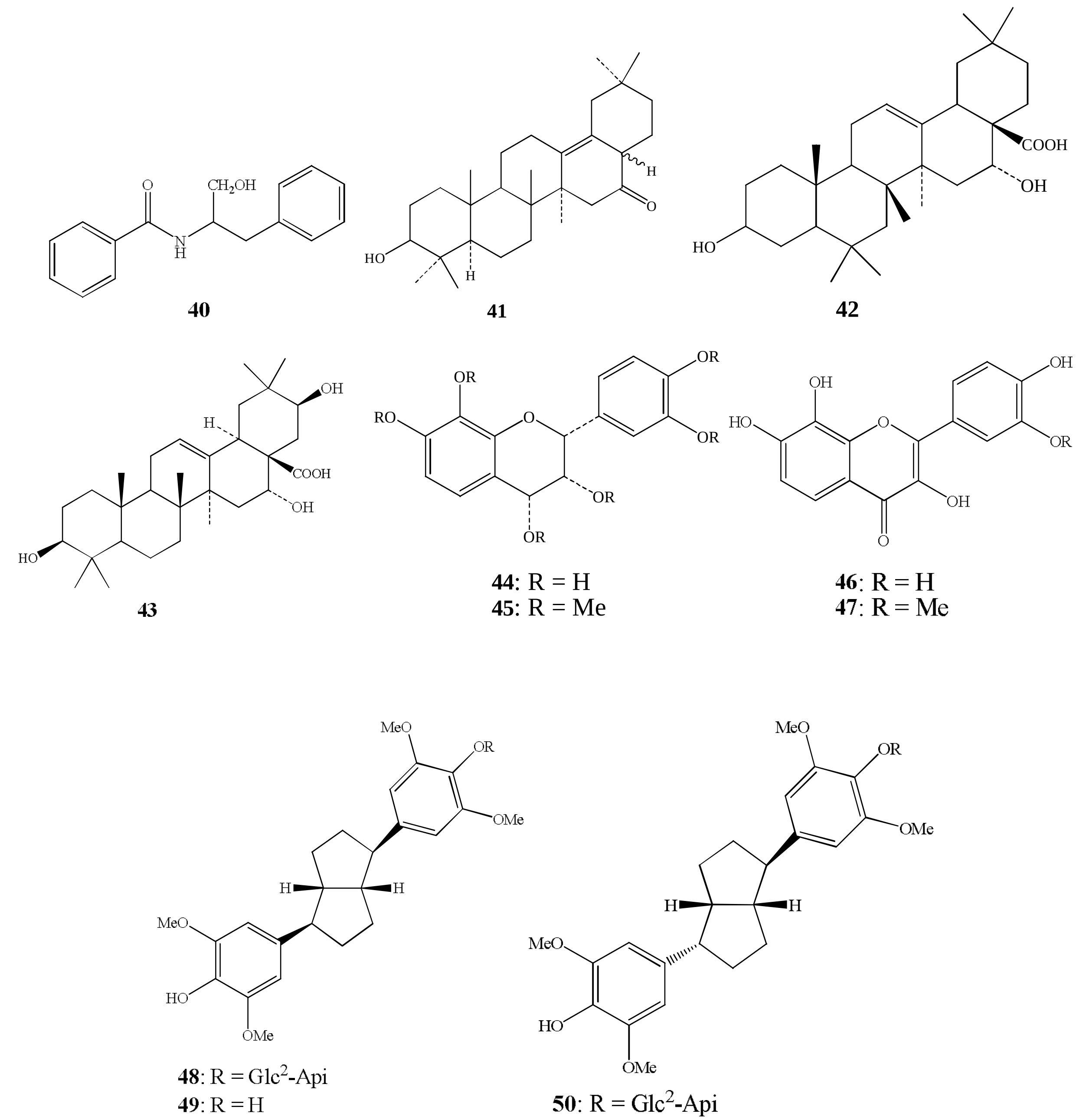

Figure 1. Secondary metabolites from *Albizzia* species.

Conclusion

A total five species of *Albizzia* have been studied. Many diversified and structurally unique molecules have been reported from these plants. Our study revealed that *Albizzia* species can be a prominent source of secondary metabolites as well as drug candidates.

References

Carpani, G., Orsini, F., Sisti, M. and Verotta, L. 1989. Saponins from *Albizzia anthelmintica*. *Phytochemistry* **28**, 863-866.

Deshpande, V.H. and Shastri, P.K. 1977. Phenolic of *Albizzia lebbeck, A. amara*, and *A. Procera*. *Indian J. Chem.* **15B**, 201-204.

Dixit, A.K. and Misra, L.N. 1997. Macrocyclic budmunchiamine alkaloids from *Albizzia lebbeck. Indian J. Nat. Pro.* **60**, 1036-1037.

Ghaly, N.S., Melek, F.R. and Abdelwahed, N.A.M. 2010. Flavonoids from *Albizzia chinensis* of Egypt. *Rev. Latinoamer. Quim.* **38**, 153-158.

Hussain, M.M., Rahman, M.S., Jabbar, A. and Rashid, M.A. 2008. Phytochemical and biological investigation of *Albizzia lebbeck*. *Boletin Latinoamericano y del Caribe de Plantas Medicinales Y Aromat.* **7**, 273-278.

Ito, A., Kasai, R., Yamasaki, K., Duct, N.M. and Nham, N.T. 1994. Lignan glycosides from bark of *Albizzia myriophylla*. *Phytochemistry* **37**, 1455-1458.

Kang, T.H., Jeong, S.J., Kim, N.Y., Higuchi, R. and Kim, Y.C. 2000. Sedative activity of two flavonol glycosides isolated from the flowers of *Albizzia julibrissin* durazz. *J. Ethnopharmacol.* **71**, 321-323.

Kirtikar, K.R. and Basu, B.D. 1980. Indian Medicinal Plants, Published by Singh, B. and Singh, M.P., India 2nd edition.

Liang, H., Tong, W.Y., Zhao, Y.Y., Cui, J.R. and Tu, G.Z. 2005. An antitumor compound Julibroside J_{28} from *Albizzia julibrissin*. *Bioorg. Med. Chem. Lett.* **15**, 4493-4495.

Nagano, H., Kato, E., Yamamura, S. and Udea, M. 2003. Fluorescence studies on nyctinasty using fluorescence labeled *cis*-p-coumaroylagmatine, a leaf opening substance of *Albizzia* plants: existence of genus-specific receptor for leaf-movement factor. *Tetrahedron Lett.* **44**, 2953-2956.

Orwa, C., Mutua, A., Kindt, R., Jamnadass, R. and Anthony, S. 2009. Agroforestree database: a tree reference and selection guide version 4.

Pal, B.C., Achari, B., Yoshikawa, K. and Arihara, S. 1995. Saponins from *Albizzia lebbeck*. *Phytochemistry* **38**, 1287-1291.

Rashid, M.A., Hauque, M.R., Sikder, M.A.A., Chowdhury, A.A., Rahman, M.S. and Hasan, C.M. 2014. Review on chemistry and bioactivities of secondary metabolites from some medicinal plants and microbes in Bangladesh. *Bangladesh Pharm. J.* **17**, 63-79.

Rashid, R.B., Chowdhury, R., Jabbar, A., Hasan, C.M. and Rashid, M.A. 2003. Constituents of *Albizzia lebbeck* and antibacterial activity of an isolated flavones derivative. *Saudi Pharm. J.* **11**, 52-56.

Sharmin, T., Islam, F., Kaiser, M.A., Al-Monsur, M.A., Sikder, M.A. and Rasid, M.A. 2014. Chemical and biological investigation of *Albizzia chinensis* (Osbeck.) Merr. *J. Phy. Sci.* **25**, 29-39.

Ueda, M., Tashiro, C. and Yamamura, S. 1997. *Cis*-p-Coumaroylagmatine, the genuine leaf-opening substance of a nyctinastic plant, *Albizzia julibrissin* durazz. *Tetrahedron Lett.* **38**, 3253-3256.

Ueda, M. and Yamamura, S. 1999. Potassium β-D-glucopyranosyl 11-hydroxyjasmonate, a leaf-closing substance of *Albizzia julibrissin* durazz. *Tetrahedron Lett*. **40**, 7823-7826.

Une, H.D., Pal, S.C., Kasture, V.S. and Kasture, S.B. 2001. Phytochemical constituents and pharmacological profile of *Albizzia lebbeck*. *J. Nat. Reme.* **1**, 1-5.

Vaeshney, I.P. 1976. Glycosides and carbohydrates from the members of the family Leguminosae. *Univ. Indore Res. J. Sci*. **4**, 13-22.

Zheng, L., Zheng, J., Zhao, Y., Wang, B., Wu, L. and Liang, H. 2006. Three anti-tumor saponins from *Albizzia julibrissin*. *Boorg. Med. Chem. Lett.* **16**, 2765-2768.

Zou, K., Tong, W.Y., Liang, H., Cui, J.R., Tu, G.H., Zhao, Y.Y. and Zhang, R. 2005. Diastereomeric saponins from *Albizzia julibrissin*. *Carbohydrate Res.* **340**, 1329-1334.

Zou, K., Zhao, Y., Tu, G., Cui, J., Jia, Z. and Zhang, R. 2000. Two diastereomeric saponins with cytotoxic activity from *Albizzia julibrissin*. *Carbohydrate Res*. **324**, 182-188.