Utilization of Halophytes as a Source of Pharmaceutical Candidates

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Introduction

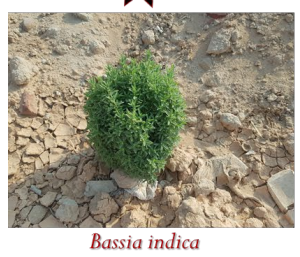
- **Halophytes** are widely distributed in many parts of the world including North Africa and Asia, and they have been consumed as food and for medicinal purposes over centuries. Historically, halophytic plants are regarded as a potential economic source of nutrients, bioactive constituents, in addition to their ability to display substantial health benefits (Petropoulos et al., 2018).
- Several bioactive natural products have been reported in the halophytic family Chenopodiaceae including sterols, alkaloids, saponins and phenolic derivatives. Additionally, various members of this family have been implied to exhibit several biological activities such as anticholinesterase, anti-inflammatory, antitumor, hepatoprotective, antidiabetic, and tyrosinase inhibitory activity (Chhikara et al., 2019; Nedialkov et al., 2009; Khan et al.,Orhan et al., 2017).
- In continuation of our ongoing projects for discovery of effective substances from halophytic plants, a study was designed aiming at isolation and characterization of compounds distributed in ***Bassia indica*** in order to shed more light toward utilization of such halophytes as a very cheap and promising source of novel bioactive compounds.

Bassia indica

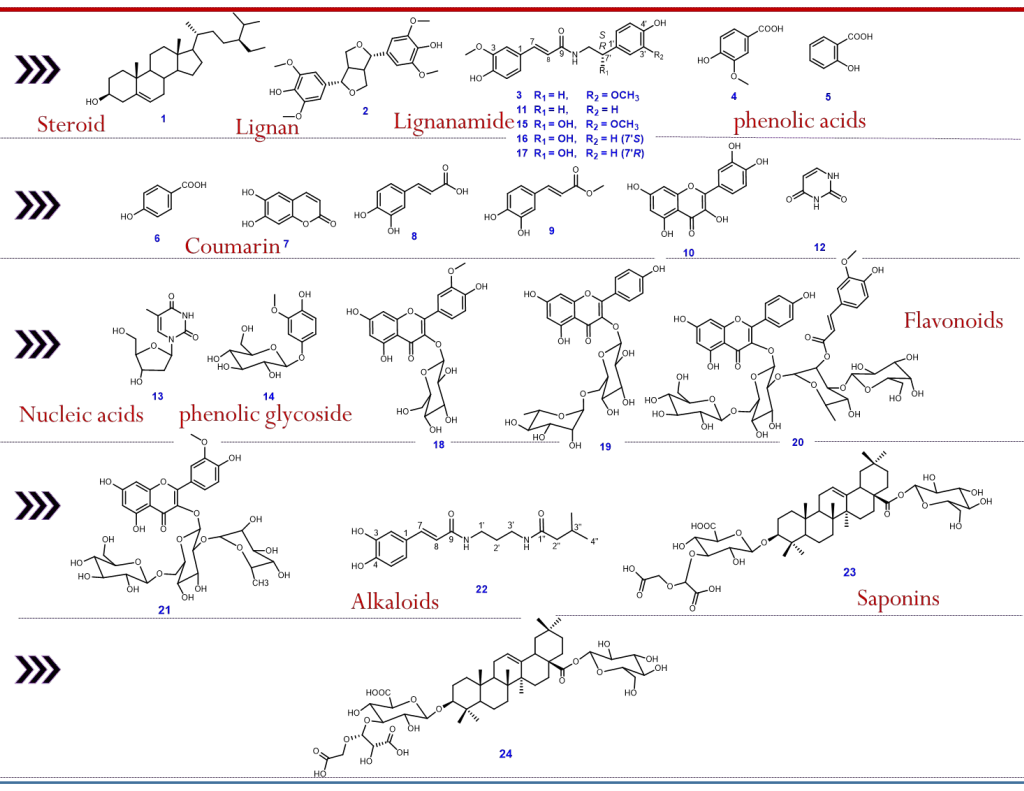
Results

- **Twenty-four compounds were isolated from the aerial parts of *B. indica*.**
- In this study, a new acylated flavonol tetraglycoside (20), rare flavonol triglycoside (21), new alkaloid (22), alongside with new *seco*-glycosidic oleanane saponin with 2'*R*,3'*S* stereocenters (24), in addition to its derivative (23), were isolated and identified. The study also reported an optimal separation and characterization of rare occurring *R*-isomer lignanamide derivative (17), in addition to its known corresponding S-isomer (16).
- Structures of the isolates were identified based on 1D, 2D-NMR analyses with the help of HR-ESI-MS.

Crude extract



Bassia indica



Dried powdered aerial parts of *Bassia indica* (2 Kg)

- Extraction with 80% MeOH at room temp.
- Concentration under reduced pressure.

Total methanolic extract (299 g)

- Suspension in distilled H_2O then fractionation using solvents of successive polarities.

DCM Fr. (8 g) → **Compounds 1-3**

EtOAC Fr. (4 g) → **Compounds 4-19**

***n*-BuOH Fr. (22 g)** → **Compounds 20-24**

Biology

- **The isolated metabolites were evaluated for their capacity to inhibit AChE and some isolated compounds showed promising therapeutic activity against AChE.**
- **Among the tested pure isolates, compounds 7, 10, 24, 19, 13, 1, and 23 exhibited marked inhibitory activity toward the acetylcholinesterase enzyme with IC_{50} 3.6, 18, 27.9, 29.6, 45.7, 55.8, 63.1 μg mL-1, respectively.**

Conclusion

- In summary, **halophytic plants** have long been regarded as useful source of lead compounds for fighting various chronic diseases including AD. The **xero-halophyte herb *B. indica*** is deemed to be a very cheap source of novel bioactive constituents.
- In the present study, the phytochemical investigation of *B. indica* resulted in isolation and identification of twenty-four compounds **categorized into various chemical classes** which enrich the chemical composition of this plant.
- The isolated compounds in this study showed **promising therapeutic activity** toward the acetylcholinesterase enzyme. Thus, the plant could be utilized as a potential source of lead drugs for medicinal purposes with economic values.
- To the best of our knowledge, this is the first report concerning a detailed phytochemical and biological characterization of the halophytic herb *B. indica* and the outcomes from this study will inspire natural product researchers to valorize and study other halophytes of the family Chenopodiaceae.

References

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For more details, please check our publications: "Bassiamide A, a new alkaloid from xero-halophyte *Bassia indica* Wight. *Natural Product Research,* 2021. "A novel acylated flavonol tetraglycoside and rare oleanane saponins with a unique acetal-linked dicarboxylic acid substituent from the xero-halophyte *B. indica*. *Fitoterapia*, 2021.