THE ASSESSMENT OF *ARISTIDA ADSCENSIONIS* AND *RUMEX HYPOGAEUS* COMPARATIVE AND COMBINE ANTIOXIDANT POTENTIAL

Fahim Ullah Khan[1], Maria Niazi[1], Surayia Shahab Rani[2], Khalid Wahab[1], Zia UD Din[1], Osama Alam[3], Autif Hussain Mangi[4], Muhammad Reyan[1], Tariq Rahim[1], Zakim Ullah[1],

[1]Department of Zoology University of Science and Technology Bannu, Khyber, Pakhtunkhwa (28100), Pakistan[2]University Department of Pharmacy, University of Sargodha, Sargodha, Punjab, 40100, Pakistan [3]Department of Biotechnology, University of Science and Technology Bannu, Khyber, Pakhtunkhwa (28100), Pakistan. [4]Institute of Biochemistry, University of Sindh Jamshoro, Sindh, Pakistan.

Correspondence:
Dr. Fahim Ullah Khan
Department of Zoology
University of Science and Technology Bannu, Khyber Pakhtunkhwa, Pakistan

Email: fahim-jani85@gmail.com

DOI: 10.38106/LMRJ.2024.6.2-02
Received: 14.05.2024
Accepted: 26.06.2024
Published: 30.06.2024

ABSTRACT

Exogenous substances and cellular metabolism both produce free radicals in cells. The produced free radicals react with cell biomolecules, including DNA. The ensuing destruction of DNA, also known as oxidative DNA damage, which is connected to aging, carcinogenesis, and mutagenesis. The *Aristida adscensionis* plays an essential role in the modulation of free radicals. We examined the antioxidant therapy of individual or combined forms of the *Aristida adscensionis* and *Rumex hypogaeus* plant extracts. We noticed that *Aristida adscensionis* showed scavenging activity at various concentrations i.e. 50, 100, 250, 500, and 1000 µg/ml was 42%, 50%, 62%, 69% and 75% respectively. The scavenging activity of *Rumex hypogaeus* at various concentrations was 43%, 52%, 58%, 66% and 75% against the standard of ascorbic acid. We noticed that the combined mixture of both plant extracts elucidated a significant antioxidant potential at different concentrations of 100 µg/ml, 500 µg/ml, and 1000 µg/ml which were 58%, 70%, 74%, 81% and 86 %. Our research study demonstrates that combinaion of both plants' extract mixtures had a more substantial antioxidant capacity than each extract individually. This property of these plants can be used for cancer treatment, however further robust data is required.

Key Words: Aristida adscensionis, Rumex hypogaeus, Antioxidant activity

INTRODUCTION

The multistage process of cancer, which includes mutational changes and uncontrolled proliferation of cells, is regarded as a leading cause of death worldwide (1, 2). Free radicals are produced in the body by a variety of endogenous and external processes (3, 4). They are typically made up of reactive oxygen species (ROS) and reactive nitrogen species (RNS). Numerous chronic diseases, including cancer, are known to be triggered by an excess of free radicals (5). Over the past few decades, the usage of herb-based medicines has been improved(6). It has been established that natural items, such as living things (plants, animals, or microorganisms), are good for both human and animal health. In underdeveloped countries, the World Health Organization (WHO) estimates that 80% of the population still relies on traditional or folk medicines, many of which are made from plants, for disease prevention or treatment (7).

Aristida adscensionis is a winter ephemeral that is found worldwide in warm temperate, tropical, and subtropical zones (8). This region naturally contains the grass *Aristida adscension*is which provides food to cattle. This species comprises 55.37% carbohydrates, 45.37% proteins, 10% ash, 28% fiber, 8% fats, and 3.9% gross energy components that have been documented, Nitrogen 0.50 %, Phosphorus 0.18%, K 6.895%, Ca 3.8%, Mg 1.1%, Fe 2.2%, Zn 0.4%, Pb 0.2%, Cr 0.02%, Cd 0.01% and Ni 0.02%(9). *Aristida adscension*

inhibits bacteria that fix nitrogen so the amount of nitrogen in the soil is reduced (10). *Aristida adscension L* is used to treat the majority of skin conditions (11).

Rumex plants (family Polygonaceae) are used in traditional medicine all over the world to treat a wide range of illnesses caused by different microorganisms (e.g., bacteria-related dermatologic conditions, dysentery and enteritis (12). There is limited data available on anti-oxidant properties individual and combine, therefore this study focused on the individual and combined antioxidant screening of *Aristida adscensionis* and *Rumex hypogaeus*.

MATERIALS AND METHODS

Materials for the Biological Assay

The various concentrations of ascorbic acids solution, 2, 2-diphenyl-1-picrylhydrazyl (DPPH) solution, the preparation of plant extractions using methanol and dilutions to various concentrations were prepared at the Laboratory of Department of Zoology, University of Science and Technology Bannu, Khyber Pakhtunkhwa, Pakistan.

Preparations of Plants Materials and Crude Extract

Aristida adscensionis and *Rumex hypogaeus* plants were collected during July 2023 at District Bannu Khyber pakhyunkhawa Pakistan. Using a pestle and mortar, fresh, shed-dried whole plants of *A. adscensions* and *R. Hypogaeus* plants were chopped into a fine powder. After the preparations of powders, they were mixed with 70% methanol until when they were completely submerged. The solutions were kept at room temperature with regular stirring for 72 hours. Whatman No. 3 filter paper was used to filter the resultant liquid. To remove the remaining liquid, the filtrate was kept at room temperature. After that, the gummy methanolic extract was lyophilized and placed inside a falcon tube. The sample that had been lyophilized was kept for later use.

Antioxidant Assay

100 µl of each of the sample solutions containing 50 µg/mL, 100 µg/mL, 250 µg/mL, 500 µg/mL and 1000/mL combined with 900 µl of DPPH. After mixing due to their sensitivity to light, all of these test tubes were incubated at 25°C for approximately 30 minutes in the dark. The absorbance of each test tube was then measured using a spectrophotometer with a wavelength of 517 nm. The ability of the samples to scavenge the DPPH free radicals was determined using the following equation;

(A1-A2/A1) ×100 = % DPPH free radicals scavenging effect A1 is the absorbance of DPPH (control)

where A2 is the absorbance of plants samples (13).

RESULTS

Antioxidant activity of *Aristida adscensionis*

Initially, we examined the antioxidant activity of *Aristida adscensionis.* We observed that the free scavenging activity against DPPH at different concentrations was significant. We found that Aristida *adscensionis* 50 ug/mL, 42%, 100 ug/mL, 50%, 250 ug/mL, 62%, 500 ug/mL, 69%, 1000 ug/mL 75% at 517nm using a double beam spectrophotometer as shown in Fig 1.

Antioxidant activity of *Rumex hypogaeus*

Next, we examined the antioxidant activity of *Rumex hypogaeus.* We found that the free scavenging activity against DPPH at different concentrations was significant. We showed that *Rumex hypogaeus* 50 ug/mL 43 %, 100 ug/mL. 52%, 250 ug/mL, 58%, 500 ug/mL, 66%, 1000 ug/mL 75% as shown in Fig 2.

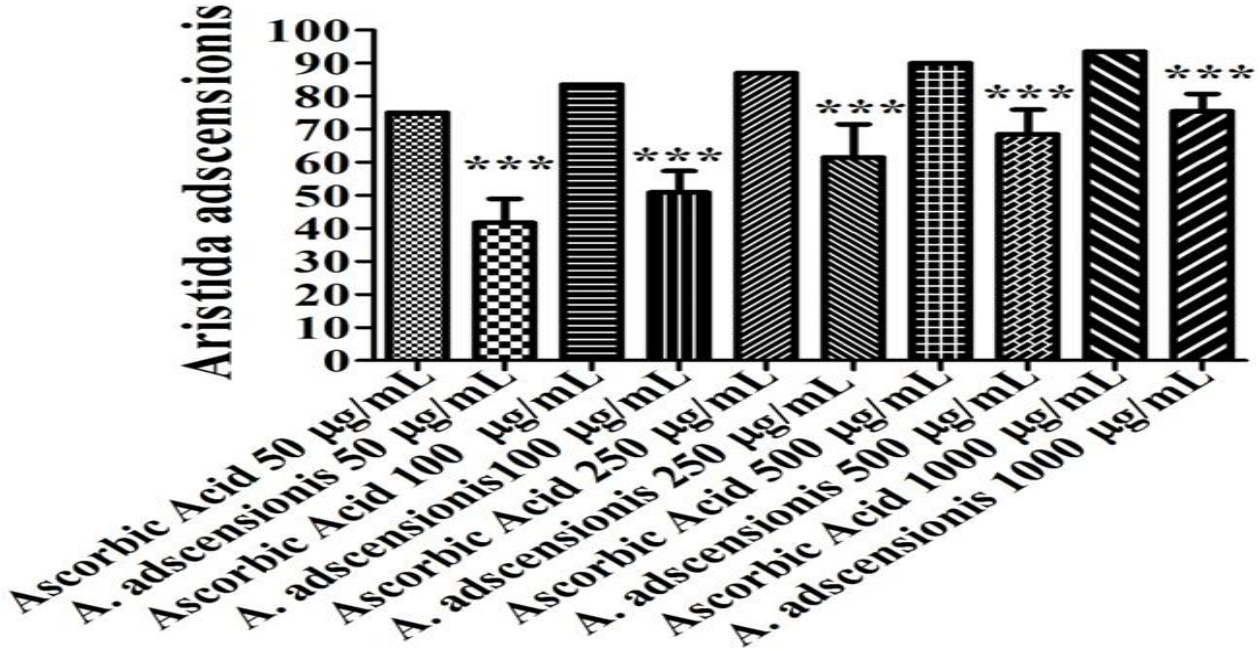

Figure 1. The antioxidant activity of *Aristidia adscensions* was performed by comparing with stander Ascorbic Acid using 50µg/mL to 1000µg/mL solutions

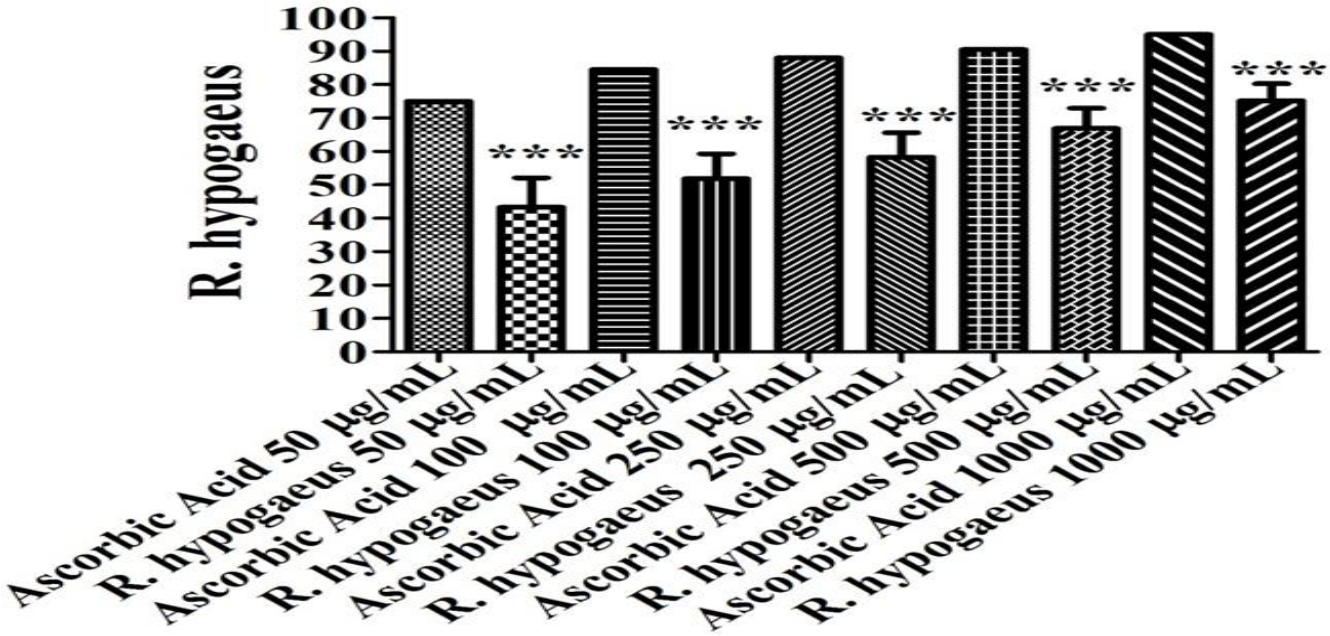

Figure 2. The antioxidant activity of *Rumex hypogaeus* was performed by comparing with stander Ascorbic Acid using 50µg/mL to 1000µg/mL solutions

Antioxidant potential of combined plant extracts *A. adscensionis* + *R. hypogaeus*

Next, we examined the antioxidant activity of both plants mixture *Aristida adscensionis* and *Rumex hypogaeus.* We found that the free scavenging activity against DPPH at different concentrations was significant. We showed that *Aristida adscensionis is* 50 ug/mL 58%, 100 ug/mL. 70%, 250 ug/mL, 74%, 500 ug/mL, 81%, 1000 ug/mL 86% as shown in Fig 3.

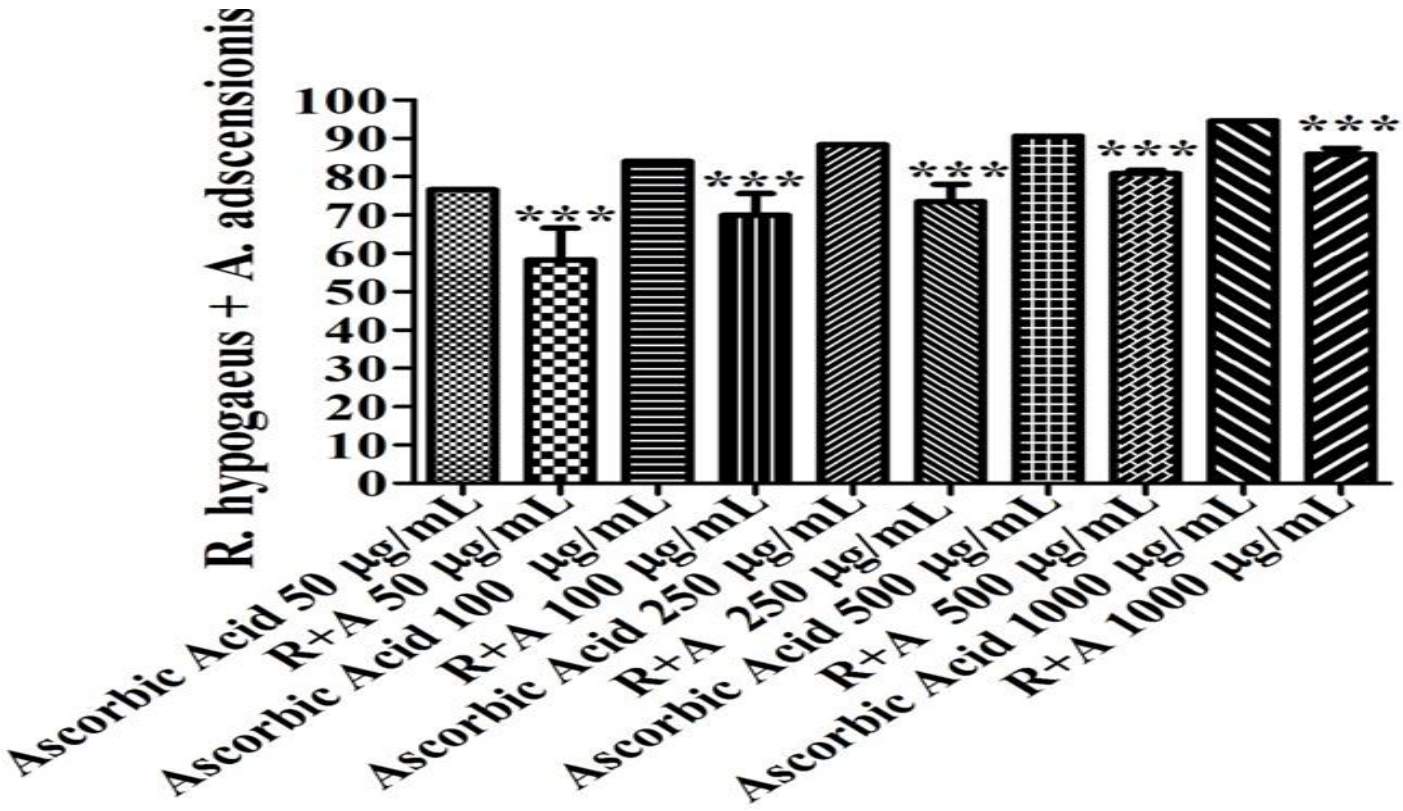

Figure 3. The combined antioxidant activity of Aristidia adscensions and Rumex hypogaeus was performed by comparing with stander Ascorbic Acid using 50µg/mL to 1000µg/mL solutions

DISCUSSION

The pathogenesis of chronic diseases including cancer, cardiovascular illnesses, diabetes, neurological disorders (Down syndrome, Parkinson's, and Alzheimer's), psychiatric disorders (depression, schizophrenia, and bipolar disorder), renal disease, lung disease (chronic pulmonary obstruction, lung cancer), and aging are all caused by oxidative stress (14, 15). The class of free radicals originating from oxygen is the most significant class produced in the biological systems. Both reactive nitrogen species (RNS) and reactive oxygen species (ROS) are free radicals which are the byproducts of regular cellular metabolism. Free radicals include hydroxyl (OH^-), superoxide (O^{-2}), nitric oxide (NO^-), nitrogen dioxide (NO^{-2}), peroxyl (ROO^-), and lipid peroxyl (LOO^-) (16). Mineral element deficiencies are the fundamental cause of many disorders; for instance, an iron shortage can result in anemia, while a zinc deficiency could accelerate the onset of lung cancer. Similarly, the hair of breast cancer patients showed decreased concentrations of Zn, Mn, Fe, Ca, Cu, and Mg (9).

Aristida adscensionis inhibits nitrogen-fixing bacteria and thus creates depleted nitrogen content in the soil. It is also used for treating skin diseases in cattle (10, 11). We examined the antioxidant therapy of the *Aristida adscensionis*. We noticed that *Aristida adscensionis* revealed a scavenging activity at various concentrations. The scavenging activity of *Aristida adsensionis* was elevated by enhancing the concentrations (50, 100, 250, 500, and 1000 µg/mL 42%, 50%,62%,69% and 75% as shown in Figure 1.

The aerial parts of Rumex species such as leaves, and roots are used as vegetables and to treat a variety of illnesses, including inflammation, constipation, mild diabetes, infections, diarrhea, oedema, and jaundice. They are also used as an antihypertensive, diuretic, and analgesic, as well as for skin, liver, gallbladder issues,

an anticoagulant, anti-hypertensive, and anti-ulcer properties (17, 18). Herein we examined the *Rumex hypogaeus* scavenging activity at various concentrations. The obtained results showed significant antioxidant activity against various concentrations 50 ug/mL 43%, 100 ug/mL. 52%, 250 ug/mL, 58%, 500 ug/mL, 66%, 1000 ug/mL 75% by comparing with the standard group of ascorbic acid (75%, 85%, 88%, 91% and 95%). Furthermore, we observed the antioxidant activity of both plant mixture which displayed a significant antioxidant potential at various concentrations 50 ug/mL, 100 µg/mL, 250µg/mL, 500 µg/mL, and 1000 µg/mL which were 58%, 70 %, 74%, 81% and 86%. We found that the combination of plants produced more significant outcomes than extracts from individual plants.

CONCLUSION

The results of the study showed considerable anti-oxidant properties of the plants, further in vitro and in vivo studies are required to confirm their anti cancer properties. Further research study needs to elucidate the molecular mechanism of the individual or combined plant mixture is also recommended.

Conflict of Interest

The authors declared that no competing interests.

Ethical Consideration

There is not ethical issue involved in this study.

REFERENCES

1. Klaunig JE. Oxidative Stress and Cancer. Current pharmaceutical design. 2018;24(40):4771-8.
2. Khan FU, Owusu-Tieku NYG, Dai X, Liu K, Wu Y, Tsai H-I, et al. Wnt/β-catenin pathway-regulated fibromodulin expression is crucial for breast cancer metastasis and inhibited by aspirin. Frontiers in pharmacology. 2019;10:1308.
3. Ullah S, Khan FU, Zaman L, Abbas S, Shah MS, Rehman JU, et al. The Assessment of the Allium sativum and Tamarix aphylla Comparative and Combined Antioxidant Potential. Journal of Pharmaceutical Research International. 2022;34(45B):7-12.
4. Khan S, Khan FU, Abbas S, Shah MS, Mangi AH, Ullah S, et al. The assessment of tamarix aphylla and calotropis procera comparative and combine antioxidant potential. Liaquat Medical Research #Journal. 2023;5(2).
5. Gupta N, Verma K. Free Radicals as a Double-Edged Sword: The Cancer Preventive and Therapeutic Roles of Curcumin. 2020;25(22).
6. Yaribeygi H, Maleki M, Majeed M, Jamialahmadi T, Sahebkar A. Renoprotective Roles of Curcumin. Advances in experimental medicine and biology. 2021;1328:531-44.
7. Tran N, Pham B. Bioactive Compounds in Anti-Diabetic Plants: From Herbal Medicine to Modern Drug Discovery. 2020;9(9).
8. Fatima S, Hameed M, Ahmad F, Ashraf M, Ahmad R. Structural and functional modifications in a typical arid zone species Aristida adscensionis L. along altitudinal gradient. Flora. 2018;249:172-82.
9. Khan A, Ullah I, Khan SU, Zhang K, Muhammad Z, Wazir SM, et al. Elemental and nutritional values of wild fodder plants of poaceae in District Bannu, Pakistan. Int J Agronomy Agric Res. 2018;13:53-61.
10. Sridhara Murthy M, Ravindra R. Allelopathic effects of Aristida adscensionis. Oecologia. 1975;18:243-9.
11. Majeed M, Bhatti KH, Amjad MS, Abbasi AM, Bussmann RW, Nawaz F, et al. Ethno-veterinary uses of Poaceae in Punjab, Pakistan. PloS one. 2020;15(11):e0241705.

12. Orbán-Gyapai O, Liktor-Busa E, Kúsz N, Stefkó D, Urbán E, Hohmann J, et al. Antibacterial screening of Rumex species native to the Carpathian Basin and bioactivity-guided isolation of compounds from Rumex aquaticus. Fitoterapia. 2017;118:101-6.
13. Shah MAR, Khan H, Khan S, Muhammad N, Ullah Khan F, Shahnaz MA, et al. Cytotoxic, anti-oxidant and phytotoxic effect of Solanum surattense Burm F fruit extracts. Int J Pharmacogn Phytochem. 2013;28(2):1154-8.
14. Jomova K, Raptova R, Alomar SY, Alwasel SH, Nepovimova E, Kuca K, et al. Reactive oxygen species, toxicity, oxidative stress, and antioxidants: Chronic diseases and aging. Archives of toxicology. 2023;97(10):2499-574.
15. Sharifi-Rad M, Anil Kumar NV, Zucca P, Varoni EM, Dini L, Panzarini E, et al. Lifestyle, oxidative stress, and antioxidants: Back and forth in the pathophysiology of chronic diseases. Frontiers in physiology. 2020;11:694.
16. Caiati C, Stanca A, Lepera ME. Free Radicals and Obesity-Related Chronic Inflammation Contrasted by Antioxidants: A New Perspective in Coronary Artery Disease. Metabolites. 2023;13(6):712.
17. Vasas A, Orbán-Gyapai O, Hohmann J. The Genus Rumex: Review of traditional uses, phytochemistry and pharmacology. Journal of ethnopharmacology. 2015;175:198-228.
18. Prakash Mishra A, Sharifi-Rad M, Shariati MA, Mabkhot YN, Al-Showiman SS, Rauf A, et al. Bioactive compounds and health benefits of edible Rumex species-A review. Cellular and molecular biology (Noisy-le-Grand, France). 2018;64(8):27-34.