Journal of Life and Social Sciences
eISSN: 3006-2675
www.bbasrjlifess.com
*J. Life Soc. Sci, Volume, **1**: 6*

Original Research Article ***Open Access***

EXPLORING CORRELATION AND REGRESSION AMONG MORPHOLOGICAL TRAITS OF *ARTEMISIA ABSINTHIUM*

NASRULLAH A, HAIDER MZ, SAMI A*

Department of Plant Breeding and Genetics, Faculty of Agricultural Sciences, University of the Punjab, Lahore, Pakistan
**Correspondence author email address: adnansami4949@gmail.com*

(Received, 10th February 2022, Revised 8th August 2022, Published 11th August 2022)

Abstract *Artemisia absinthium, a significant perennial shrub, has a rich history of traditional medicinal use for treating various ailments, such as hepatitis, gastritis, jaundice, and aiding in wound healing. It has also demonstrated effectiveness against conditions like heartburn, indigestion, gassiness, stomach discomfort, and anemia. Beyond its medicinal uses, Artemisia absinthium exhibits properties such as being depressive, antifungal, antimicrobial, anthelmintic, and antioxidant. While it is commonly found along highways and in pastures, it is predominantly cultivated in arid, open waste areas. Research indicates a positive correlation between height, fresh weight, dry weight, and moisture content. The study revealed that site two is conducive to the optimal development of Artemisia absinthium, even though it is primarily cultivated in pastureland and farmland. Additionally, the leaf extracts of Artemisia absinthium have been observed to inhibit the germination of needle and thread grass, suggesting its potential as a natural weed control agent. Therefore, removing these invasive weeds in areas where Artemisia absinthium is cultivated is recommended.*

[*Citation: Nasrullah, A., Haider, M.Z., Sami, A. (2022). Exploring correlation and regression among morphological traits of Artemisia absinthium. J. Life Soc. Sci, **2022**: 6*]
Keywords: *Artemisia absinthium; medicinal use; morphological traits; correlation; regression*

Introduction

Artemisia absinthium is an herb also known as common wormwood, absinth sagewort and common sagewart. Native to temperate areas of Eurasia and North Africa, Artemisia species have become widely naturalized in northern Canada and the United States. This plant is used to flavor the beverage of the same name. In some locations, it is weedy and has naturalized in squatter areas in the northern United States (Batiha et al., 2020). It was first grown for medical and social purposes in the early 19th century and is a perennial herbaceous plant that typically grows 4 to 5 feet tall. *A. absinthium* has been shown to have a tetraploid level (2n=36) and a diploid number (2n=18). It possesses tiny glands that produce oil. The plant is a component of the absinthe spirit and is used for flavoring in other spirits and wines (Sami et al., 2023a; Szopa et al., 2020). Common wormwood was used in the Middle Ages to flavor mead, a traditional Bohemian beverage, and it is combined with Sheeba, a type of tea, in Morocco**.** It tastes warm and delicious and has a leafy stem. The stem is 2-2.5 feet tall, white in color, and covered with tiny and silky hairs. The leaf stems are somewhat winged at the border, and the leaves are white, measuring 3 inches long by 1.5 inches broad with thin and unshaped portions (Ahamad, 2019). Early summer to early fall are the times when flowers bloom**.** The small flowers are drooping, and have a greenish-yellow tint. The flower heads are short, almost orbicular, and hang in a vertical, leafy panicle**.** It was recently discovered that wormwood extract includes a substance that accelerates senescence when tested using segments of oat leaves (Abbas et al., 2016; Bailen et al., 2013; Sami et al., 2023b). Fennel seed germination and growth have been reported to be inhibited by wormwood extracts, and the suppression has been linked to the presence of absinthin, artemetin, and other similar chemicals in this plant. Today, *A. absinthium* plays a significant part in the production of cosmetics (Ali et al., 2014a; Ali et al., 2014b; Bhat et al., 2019; HUSSAIN et al., 2023). In the food business, it also has a well-known position for alcoholic beverages. It is now a subject of biotechnological study as well. The above-ground sections of *A. absinthium* are a convenient and delectable source of natural antioxidants and antidepressants (Goud et al., 2015). *A. absinthium* extracts and essential oils are used to cure several diseases. Oil of *A. absinthium* has been found to resist bugs, flies, and mosquitoes and to kill houseflies.

Anthelmintic, antibacterial, insect repellent, narcotic, digestive, tonic, and other bioactivities are characteristic of preparations from wormwood plants (Rezaeinodehi and Khangholi, 2008).

Importance and use of wormwood as a medicinal herb

The bitter taste of wormwood has long been connected with it. Since the word "worm" is spelled "werm" in Old German, the moniker "Wermut" refers to the antiphrastic effect of this plant. This term can be found in Germanic texts that discuss herbal medicine. When taken as a tincture, Wormwood provides warming, invigorating, and anti-poisoning qualities. It can also aid with stomach and gastrointestinal problems. By soaking wormwood in vodka, wine, or water with pepper and aqua vitae (spirit) was used to alleviate fever and gastrointestinal pain. Wormwood has long been associated with a bitter flavor (Craciunescu et al., 2012; Haider et al., 2023). The term "Wermut" denotes the antiphrastic action of this herb known for its bitter taste (the word "worm" in Old German is "werm"). This name appears in Germanic literature on herbal treatment. When taken as a tincture, wormwood has warming, stimulating properties, can help with stomach and abdominal discomfort, and is poison-resistant (Sami et al., 2023b; Sami et al., 2023c). Wormwood treats stomach discomfort and fever by soaking it in vodka, wine, or water with pepper and aqua vitae (spirit) **(**Szopa et al., 2020**)**. The healing spectrum of wormwood is very similar to that of mugwort (Artemisia *vulgaris*, a close relative); compared to mugwort, wormwood has a slightly stronger effect on the digestive system. Apart from the characteristic bitterness, another property of wormwood has been known since antiquity—depending on the dose, it excites the central nervous system, causing even epileptic seizures and hallucinations (Islam et al., 2023; Szopa et al., 2020). It is utilized to strengthen memory, reduce liver inflammation, and repair mental function. According to specialists in Chinese medicine, the plant can be used to treat tumors, neurological illnesses, and serious bacillary dysentery. In Iran, the plant is used to produce tea that helps with childbirth discomfort as well as leukemia and sclerosis treatment. It has been demonstrated that *A. absinthium* aerial portion still contains anti-snake venom action. One of the most notable biological effects associated with many members of the genus Artemisia is its anticancer properties (Beigh and Ganai, 2017).

Materials and methods:

This study's trial course involved collecting samples of *A. absinthe* from three different locations of Punjab University, Lahore, Pakistan, each with three replications, resulting in nine replications. A descriptive small sample was obtained by manually digging the soil and the weed plant.

Leaf Length (cm)

Three leaves were randomly carefully chosen from each plant to measure the leaf length. Their length was noted down with the help of using a cm scale or ruler. The average value of the three measurements was then calculated.

Leaf Width (cm)

The width of leaf was measured at three points on each leaf: the base, center, and tip. Three leaves were randomly selected from each plant, and each point's width was noted. The overall value of the three measurements was then calculated.

Leaf Area (cm2)

The leaf area was determined by multiplying the leaf length by the leaf width and a correction factor of 0.74 cm using MicrosoftExcel or calculator. The formula used to calculate the leaf area was as follows: $\boldsymbol{Leaf\ area = leaf\ width \times leaf\ length \times 0.74}$

Plant Height (cm)

The measurement scale measured plant height, and the process started from the point of attachment of the stem to the root (base of the stem). The shoot on each plant was measured and noted down.

Fresh Weight (g)

The weed plant's or herb's fresh weight was instantly calculated after the weed sample was taken from the field. This was done to prevent the sample from drying out. The electronic weight balance was used to measure the weight of the sample, both with and without the inflorescence.

Dry Weight (g)

Dry weight was taken after the sample was dried. Sun drying method was used to dry the selected sample. Each sample was chockfull separately in envelopes and left to dry for 8-13 hours in a proper place with sufficient sunlight. After the samples were dried under sunlight, each was weighed on a balance, both with and without the inflorescence.

Moisture Percentage (%)

Moisture percentage of the selected sample was calculated by using the following formula both with and without the inflorescence:

$\boldsymbol{Moisture\ percentage = fresh\ plant\ weight - dry\ plant\ weight\ /fresh\ plant\ weight \times 1oo}$

Results and discussions:

Discoveries (from Table 1) show distinguished variations among all the locations and studied traits of *A. absinthe*. Specially, the average plant height was measured to be around (25.778 ± 4.0638 cm), leave width (3.3111 ± 0.1851cm), leave length (11.089 ± 0.604 cm), leave area (27.733 ± 2.3733cm), root length (45.433 ± 0.2377 cm), fresh weight (8.6333 ± 1.1707g), dry weight (2.5556g ± 0.3899g), and moisture (71.611 ± 1.8384 cm) for *A. absinthe* plants collected from three different locations. *A. absinthe* is superior to withstand harsh climatic conditions, as evidenced by its high moisture percentage and root length (Ali et al., 2017; Hussain et al., 2017; Qurban et al., 2012). A high root length of *A. absinthium* means it can absorb many essential nutrients that will increase plant height and strengthen the plant in its

place due to high root length. Still we need to remove these herbs near vegetation due to its highly competitive nature of absorbing many nutrients provided to other plants grown in surrounding areas, leading to low crop yield.

Table 1. Analysis of Variance of morphological traits of Artemisia absinthium

	Plant **Height**	**Leaf Width**	**Leaf Length**	**Leaf Area**	**Root Length**	**Fresh Weight**	**Dry Weight**	**Moisture**
Location	48.3611	1.25444	10.0811	237.163	2.56778	35.9033	3.84778	34.1111
Error	49.6528	0.10278	1.0944	16.898	0.16944	4.1117	0.45611	10.1394
Grand Mean	25.778*	3.3111*	11.089*	27.733*	45.344*	8.6333*	2.5556*	71.611*
CV	27.34	9.68	9.43	14.82	7.7	23.49	26.43	4.45
Standard Error	4.0683	0.1851	0.604	2.3733	0.2377	1.1707	0.3899	1.8384

A correlation analysis observed the relationship between various morphological traits of *A. absinthium* (Table 2). The results showed that almost all studied traits revealed significant and positive correlations, showing the plant's ability to withstand harsh and hot environmental conditions (Ahsan et al., 2013; Mazhar et al., 2020). This flexibility is likely recognized as the plant's higher photosynthetic rate. However, there is an exception between leaf length, which is not correlated with root length and moisture; it shows a negative correlation between them**.** Also dry weight, leaf area, and plant height are not correlated with root length. To prevent potential yield losses in crop plants, controlling the growth of common wormwood is important around other crops. Manual removal and the sensible use of chemicals can successfully manage these disturbing plants. Farmers can safeguard crops and enhance agricultural production (Ali et al., 2013; Ali et al., 2016; Iqra et al., 2020; Reinhardt et al., 2003).

Table 2. Correlation among morphological traits of *A. absinthium*

Traits	**Dry Weight**	**Fresh Weight**	**Height**	**Leave Area**	**Leave Length**	**Leave Width**	**Moisture**
Fresh Weight	0.9893*						
Plant **Height**	0.5919*	0.5478*					
Leaf Area	0.7018*	0.7416*	0.5097*				
Leaf Length	0.4962*	0.5569*	0.2799	0.881*			
Leaf Width	0.6962*	0.7125*	0.5762*	0.9072*	0.6209*		
Moisture	-0.843*	-0.7633*	-0.6175*	-0.3156*	-0.0568	-0.4329*	
Root Length	0.6132	0.6096*	0.3372	0.3189	-0.0439	0.5899*	-0.6142*

Regression analysis is displayed in (Table 3). Regression analysis was conducted to evaluate the influential traits affecting fresh weight. The results revealed that dry weight (3.811) was the most significant contributing factor, followed by root length (0.285), moisture (0.259), leaf length (0.127), and plant height (0.018). Conversely, leaf area (-0.052), leaf width (-0.089) were identified as negatively contributing traits towards fresh weight (Table 3). The regression equation predicting the relationship was formulated as follows:

Y = 12.618 + dry weight (3.811) + root length (0.285) + moisture (0.259) + leaf length (0.127) + plant height (0.018) - leaf area (0.052) - leaf width (0.089)

Regression analysis is an important tool for plant researchers to recognize the key plant traits that expressively affect crop yield to estimate the effect of some explanatory variable on the dependent variable (Abbas et al., 2016; Ali et al., 2016; Masood et al., 2015; Moacă et al., 2019).

Table 3. Stepwise multiple linear regression for plant fresh weight of *A. absinthium*

Traits	**Coefficient**	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95 %**
Plant **Height**	0.018	0.020	0.886	0.538	-0.239	0.275
Leaf Width	-0.089	1.338	-0.067	0.958	-17.084	16.906
Leaf Length	0.127	0.285	0.445	0.733	-3.491	3.745
Leaf Area	-0.052	0.157	-0.329	0.798	-2.049	1.946
Root Length	0.285	0.281	1.016	0.495	-3.281	3.851
Dry Weight	3.811	0.462	8.248	0.077	-2.059	9.681
Moisture	0.259	0.081	3.191	0.193	-0.773	1.292

Conclusion

According to the study and results, location 2 is most favorable for the growth of *A. absinthium* based on environmental conditions. However, removing these weeds from the places they are not needed is

recommended to reduce losses in grasslands and croplands and to avoid other distractions.

Reference

Abbas, H. G., Mahmood, A., and Ali, Q. (2016). Zero tillage: a potential technology to improve cotton yield. *Genetika* **48**, 761-776.

Ahamad, J. (2019). A pharmacognostic review on Artemisia absinthium. *International Research Journal of Pharmacy* **10**, 25-31.

Ahsan, M., Farooq, A., Khaliq, I., Ali, Q., Aslam, M., and Kashif, M. (2013). Inheritance of various yield contributing traits in maize (Zea mays L.) at low moisture condition. *African Journal of Agricultural Research* **8**, 413-420.

Ali, F., Ahsan, M., Ali, Q., and Kanwal, N. (2017). Phenotypic stability of Zea mays grain yield and its attributing traits under drought stress. *Frontiers in plant science* **8**, 1397.

Ali, Q., Ahsan, M., Ali, F., Aslam, M., Khan, N. H., Munzoor, M., Mustafa, H. S. B., and Muhammad, S. (2013). Heritability, heterosis and heterobeltiosis studies for morphological traits of maize (Zea mays L.) seedlings. *Advancements in Life sciences* **1**.

Ali, Q., Ahsan, M., Kanwal, N., Ali, F., Ali, A., Ahmed, W., Ishfaq, M., and Saleem, M. (2016). Screening for drought tolerance: comparison of maize hybrids under water deficit condition. *Advancements in Life Sciences* **3**, 51-58.

Ali, Q., Ali, A., Ahsan, M., Nasir, I. A., Abbas, H. G., and Ashraf, M. A. (2014a). Line× Tester analysis for morpho-physiological traits of Zea mays L seedlings. *Advancements in Life sciences* **1**, 242-253.

Ali, Q., Ali, A., Awan, M. F., Tariq, M., Ali, S., Samiullah, T. R., Azam, S., Din, S., Ahmad, M., and Sharif, N. (2014b). Combining ability analysis for various physiological, grain yield and quality traits of Zea mays L. *Life Sci J* **11**, 540-551.

Bailen, M., Julio, L. F., Diaz, C. E., Sanz, J., Martínez-Díaz, R. A., Cabrera, R., Burillo, J., and Gonzalez-Coloma, A. (2013). Chemical composition and biological effects of essential oils from Artemisia absinthium L. cultivated under different environmental conditions. *Industrial crops and products* **49**, 102-107.

Batiha, G. E.-S., Olatunde, A., El-Mleeh, A., Hetta, H. F., Al-Rejaie, S., Alghamdi, S., Zahoor, M., Magdy Beshbishy, A., Murata, T., and Zaragoza-Bastida, A. (2020). Bioactive compounds, pharmacological actions, and pharmacokinetics of wormwood (Artemisia absinthium). *Antibiotics* **9**, 353.

Beigh, Y. A., and Ganai, A. M. (2017). Potential of wormwood (Artemisia absinthium Linn.) herb for use as additive in livestock feeding: A review. *The pharma innovation* **6**, 176.

Bhat, R. R., Rehman, M. U., Shabir, A., Rahman Mir, M. U., Ahmad, A., Khan, R., Masoodi, M. H., Madkhali, H., and Ganaie, M. A. (2019). Chemical composition and biological uses of Artemisia absinthium (wormwood). *Plant and Human Health, Volume 3: Pharmacology and Therapeutic Uses*, 37-63.

Craciunescu, O., Constantin, D., Gaspar, A., Toma, L., Utoiu, E., and Moldovan, L. (2012). Evaluation of antioxidant and cytoprotective activities of Arnica montana L. and Artemisia absinthium L. ethanolic extracts. *Chemistry Central Journal* **6**, 1-11.

Goud, B. J., Dwarakanath, V., and Swamy, B. (2015). A review on history, controversy, traditional use, ethnobotany, phytochemistry and pharmacology of Artemisia absinthium Linn. *International Journal of Advanced Research in Engineering and Applied Sciences* **4**, 77-107.

Haider, M. Z., Sami, A., Shafiq, M., Anwar, W., Ali, S., Ali, Q., Muhammad, S., Manzoor, I., Shahid, M. A., and Ali, D. (2023). Genome-wide identification and in-silico expression analysis of carotenoid cleavage oxygenases gene family in Oryza sativa (rice) in response to abiotic stress. *Frontiers in Plant Science* **14**.

Hussain, M., Raja, N. I., Akram, A., Iftikhar, A., Ashfaq, D., Yasmeen, F., Mazhar, R., Imran, M., and Iqbal, M. (2017). A status review on the pharmacological implications of Artemisia absinthium: A critically endangered plant. *Asian Pac J Trop Dis* **7**, 185-192.

Hussain, Z., Muzamil, M., Saeed, M., Naheed, K., Kareem, M., Munir, A., Haider, M., and Sami, A. (2023). Trait correlations and implications for yield potential in cotton: A comprehensive study. *Biological and Agricultural Sciences Research Journal* **2023**, 24-24.

Iqra, L., Rashid, M. S., Ali, Q., Latif, I., and Mailk, A. (2020). Evaluation for Na+/K+ ratio under salt stress condition in wheat. *Life Sci J* **17**, 43-47.

Islam, M. A. U., Nupur, J. A., Shafiq, M., Ali, Q., Sami, A., and Shahid, M. A. (2023). In silico and computational analysis of zinc finger motif-associated homeodomain (ZF-HD) family genes in chilli (Capsicum annuum L). *BMC genomics* **24**, 603.

Masood, S. A., Jabeen, S., Anum, M., Naseem, Z., Jamshaid, A., and Ali, Q. (2015). Genetic Association of transcriptional factors (OsAP2 gene family) to incorporate drought tolerance in rice. *Life Science Journal* **12**, 71-76.

Mazhar, T., Ali, Q., and Malik, M. (2020). Effects of salt and drought stress on growth traits of Zea mays seedlings. *Life Science Journal* **17**, 48-54.

Moacă, E.-A., Pavel, I. Z., Danciu, C., Crăiniceanu, Z., Minda, D., Ardelean, F., Antal, D. S., Ghiulai, R., Cioca, A., and Derban, M. (2019). Romanian wormwood (Artemisia absinthium L.): Physicochemical and nutraceutical screening. *Molecules* **24**, 3087.

Qurban, A., Muhammad, A., Tahir, M. H. N., and Basra, S. M. A. (2012). Genetic evaluation of maize (Zea mays L.) accessions for growth related seedling traits. *International Journal for Agro Veterinary and Medical Sciences (IJAVMS)* **6**, 164-172.

Reinhardt, F., Herle, M., Bastiansen, F., and Streit, B. (2003). Economic impact of the spread of alien species in Germany. *Berlin, Germany: Federal Environmental Agency (Umweltbundesamt)*.

Rezaeinodehi, A., and Khangholi, S. (2008). Chemical composition of the essential oil of Artemisia absinthium growing wild in Iran. *Pak J Biol Sci* **11**, 946-949.

Sami, A., HAIDER, M., MEERAN, M., ALI, M., Abbas, A., Ali, Q., and Umar, M. (2023a). Exploring morphological traits variation in chenopodium murale: a comprehensive multivariate analysis. *Bulletin of Biological and Allied Sciences Research* **2023**, 43-43.

Sami, A., Haider, M. Z., Shafiq, M., Sadiq, S., and Ahmad, F. (2023b). Genome-Wide Identification and In-silico Expression Analysis of CCO Gene Family in Sunflower (Helianthus annnus).

Sami, A., Saeed, M., Shafiq, M., Abbas, S. M., Anum, A., Haider, H., Bhatti, M. H. T., Raza, M. A., Khan, N., and Shahid, N. A. (2023c). Role of Horticulture in Disaster Risk Management. *In* "Disaster Risk Reduction in Agriculture", pp. 393-406. Springer.

Szopa, A., Pajor, J., Klin, P., Rzepiela, A., Elansary, H. O., Al-Mana, F. A., Mattar, M. A., and Ekiert, H. (2020). Artemisia absinthium L.—Importance in the history of medicine, the latest advances in phytochemistry and therapeutical, cosmetological and culinary uses. *Plants* **9**, 1063.

.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Funding

Not applicable

Conflict of Interest

Regarding conflicts of interest, the authors state that their research was carried out independently without any affiliations or financial ties that could raise concerns about biases.