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Updating the Geographical Distribution of Twenty- Eight Species of the Egyptian Flora

Sara M. Hassanen[1], Elsayeda M. Gamal Eldin[1], Wafaa M. Kamel[1] and Yasmin M. Hassan[1,*]

[1] Botany & Microbiology Department, Faculty of Science, Suez Canal University, Ismailia-Egypt.

***Corresponding author: yasmin_ibrahim@science.suze.edu.eg**

ABSTRACT

The Egyptian flora has been suffering from great changes in the distribution of some plants since the last flora of Egypt in 2005. The factors affecting this distribution are temperature, rainfall, agricultural practices, construction activities etc. So, the geographical distributions of many species needed to be revised and updated. This investigation updated the distribution of twenty-eight species in different phytogeographical regions of Egypt according to some previous studies and herbarium records. These species were freshly collected materials from different phytogeographical areas. They belonged to fourteen families including twenty-four genera and eight sub-species. The revision of their geographical distribution showed the newly addition of sixteen species to the flora of the Eastern desert. Additionally, eight species were recorded to the flora of Deserts except that of Sinai. Finally, nine species were added to the flora of the Mediterranean region. The present research aims to update the distribution of twenty-eight species in different phytogeographical regions of Egypt according to some previous studies and herbarium records. These species belonged to fourteen families including twenty-four genera and eight sub-species. The revision of their geographical distribution showed the newly addition of sixteen species to the flora of the Eastern desert such as: *Cynanchum acutum*, *Amaranthus blitum* and *Euphorbia helioscopia*. Additionally, eight species were recorded to the flora of Deserts except that of Sinai among them: *Heliotropium aegyptiacum*, *Chloris virgata* and *Commelina bengnalensis*. Finally, nine species were added to the flora of the Mediterranean region e.g., *Veronica anagaIlis-aquatica*, *Leptochola panicea* and *Chenopodium ficifolium*.

Key Words:

Phytogeographical Regions, Distribution, Egypt, Flora

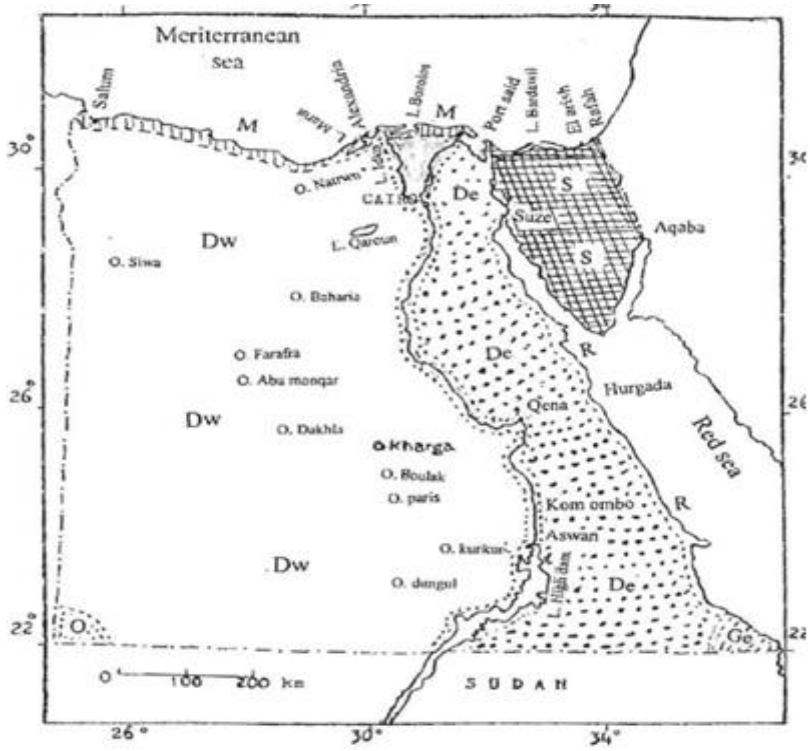
1. INTRODUCTION

The last checklist showed the geographical distribution of all plants in the Egyptian flora was given by Boulos (2009) [1]. Consequently, this flora is thirteen years old. This period was long enough to alter the geographic distribution of numerous wild plants. Their distribution is controlled by many factors abiotic and biotic such as climate and edaphic factors, water, and rainfall content. In addition, the performance of agricultural expansion in many new areas i.e., Nile valley and east and west Delta, Suez Canal region, El-Qantara Sharq, Sahl El-Tina, Toushky at Western Desert and Sharq El-Uweinat [2]. Moreover, the human activities represented in agricultural practices, global trade and construction works led to soil transfer from one area to another. Egypt suffers from huge variation in climatic conditions which is the major factor affecting the distribution of the major vegetation types. It can shift plants distribution to newly favorable areas and decline its presence in other locations. There were some previous studies concerning the geographical distribution updating of some wild plants among them: Al-Khanagry and Mohamed (2004) [3] revised the distribution of 37 species, 34 genera and l8 families. While Habeeb *et al.* (2015) [2] introduced new distribution of 38 species belonging to 34 genera and 22 families. Moreover, El-Beheiry *et al.* (2020) [4] renewed the checklist of the alien flora which represents 11.7% of the Egyptian flora and El-Khalafy *et al.* (2021) [5] updated the plant endemism of 42 species (belonging to 37 genera and 20 families. This study aims to update the geographical distribution of some species and describe the various factors altering their distribution.

2. MATERIALS AND METHODS

The present investigations targeted some fresh specimens gathered during the period from winter 2020 to spring 2022 from their natural habitats including various phytogeographical areas. The identification of specimens was performed by using botanical keys given by Boulos (1999, 2000, 2002, 2005) and Täckholm (1974) [6,7,8,9,10]. In addition to using the floras of different neighboring countries e.g., Zohary and Feinbrun-Dothan (1966) and Migahid (1978) [11,12] to achieve an accurate identification. According to Hosni and Shamso (2022) [13] the recent valid names of the recorded taxa and families were revised and verified. The specimen's geographical distribution was checked to that given by Boulos (2009) [1].

The new locations of these wild plants were determined according to some previous studies namely; Khedr and Zahran (1999) Mashaly *et al.* (2002), Abd El-Hamid (2005), Shaltout and Galal (2007), Abd El-Hamid and Kamel (2010), Bidak *et al.* (2013), Abd El-Ghani *et al.* (2014), Serag *et al.* (2015), Shaltout *et al.* (2015), Hamdy *et al.* (2017), Abd El-Hamid (2017), Mohamed and Azer (2012), El Bous and Abd El-Hamid (2018), Hassanen *et al.* (2022) [14,15,16,17,18,19,20,21,22,23,24,25,26,27]. Moreover, using some herbarium sheets kept in Suez Canal university herbarium (SCU-I). Map 1 shows the phytogeographical regions given in this investigation.



Map (1): The Phytogeographical Regions were Indentified According to Boulos (2009) [1]. Abrevation: N: The Nile region including Delta, Valley and Faiyum., O: The oases of the Western Desert: Wadi Natrun. Siwa, Farafra, Bahariya, Kharga, Dakhla. Kurkur, Dungul and Uweinat, M: The Mediterranean coastal strip from the border with Libya near Sollum to Port Said, D: All the deserts of Egypt except that of Sinai, De: Desert east of the Nile except that of Sinai, Dw: Desert west of the Nile, R: The Red Sea coastal strip, GE: Gebel Elba and the surrounding mountainous region and S: The entire Sinai Peninsula including the coastal Mediterranean strip and El-Tih Desert East of Suez Canal.

3. RESULTS

This study targeted twenty-eight species belonging to fourteen families and twenty-four genera. The geographical distribution of these species was updated according to some previous studies and herbarium records. It revealed that the Eastern desert and Red Sea flora have been enriched with new sixteen species among them: *Plantago major, Amaranthus hybridis* and *Ammi majus*. Moreover, the Desert's flora has been increased with ten species among them: *Trianthema portulacastrum* and *Setaria viridis* and the Mediterranean region's flora has been raised by nine species among them: *Capsella bursa-pastoris* and *Cenchrus biflorus.*

Amaranthaceae

1. Amaranthus hybridis* L. ssp. *hybridis

N, O, M, S [1]

Transferred to **De, R** as recorded by Abd El-Hamid (2017) [24] in Suez

Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

***2. Amaranthus blitum* L. subsp. *oleraceus* (L.) Costea**.

N, M, S [1]

Transferred to **De** as recorded by Hamdy *et al.* (2017) [23] and Hassanen *et al.* (2022) [26] in Ismailia-Suez highway

***3. Chenopodium ficifolium* Sm.**

N, De [1]

Transferred to **M** as recorded by Mashaly *et al.* (2002) [15] and Serag *et al.* (2015) [21] in Damietta area, Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway.

***4. Chenopodium glaucum* L.**

N, M [1]

Transferred to **De, R** as recorded by Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway.

Apiaceae

***5. Ammi majus* L.**

N, O, M, S [1]

Transferred to **De and R** as recorded by Abd El-Ghani *et al.* (2014) [20] in the Eastern desert, Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

6. Foeniculum vulgare* MilL. ssp. v*ulgare

S [1]

Transferred to **D** as recorded Hassanen *et al*. (2022) [27] in Ismailia city, collected by Wafaa M. Kamel from botanical garden of Agricultural University, Ismailia city at 15/4/1994 (SCU-I herbarium sheet).

Apocynaceae

7. Cynanchum acutum* L. ssp. *acutum

N, O, M [1]

Transferred to **De, R** as recorded by Abd El-Ghani *et al.* (2014) [20] in the Eastern desert,

Abd El-Hamid (2017) [24] in Suez and Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

Transferred to **R** as recorded by Habeeb *et al.* (2015) [2].

Azoiaceae

***8. Trianthema portulacastrum* L.**

GE [1]

Transferred to **D** as recorded by Abd El-Hamid (2005) [16] in Ismailia governorate, Hassanen *et al.* (2022) [27] in Ismailia city.

Transferred to **N** as recorded by Habeeb *et al.* (2015) [2]

Boraginaceae

***9. Heliotropium aegyptiacum* Lehm.**

N, Ge [1]

Transferred to **D** as recorded by Hassanen *et al.* (2022) [27] in Ismailia city and collected by Elsayeda M. Gamal Eldin from waste land, Ismailia city at 21/4/2012 (SCU-I herbarium sheet).

Brassicaceae

***10. Brassica nigra* (L.) Koch.**

N, O, M, S [1]

Transferred to **De, R** as recorded by Abd El-Ghani *et al.* (2014) [20] in the Eastern desert,

Abd El-Hamid (2017) [24] in Suez

***11. Capsella bursa-pastoris* (L.) Medik.**

N [1]

Transferred to **De, R, D, M** as recorded by Abd El-Hamid (2017) [24] in Suez

Abd El-Hamid (2005) [16] in Ismailia governorate, Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway, Ismailia city and Ismailia-Suez highway, Khedr and Zahran (1999) [14] and Shaltout and Galal (2007) [17] in lake Manzala, Mashaly *et al.* (2002) [15] in Damietta area

12. Raphanus raphanistrum* L. *ssp raphanistrum

N, M [1]

Transferred to **De, R** as recorded by Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

Euphorbiaceae

***13. Euphorbia helioscopia* L.**

N, M [1]

Transferred to **De, R** as recorded Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

Fabaceae

14. Trigonella glabra* Thunb. subsp. *glabra

N, M, O, S [1]

Transferred to **De, R** as recorded by Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

15. Vicia sativa* L. ssp. *sativa

N, M [1]

Transferred to **De** as recorded by Hamdy *et al.* (2017) [23] in Ismailia-Suez highway, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

Lamiaceae

16. Lamium amplexicaule* L. subsp. *amplexicaule

N, O, M, S [1]

Transferred to **De, R** as recorded Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

Portulacaceae

***17. Portuclaca oleracea* L.**

N, O, M, S [1]

Transferred to **De, R** as recorded by Abd El-Ghani *et al.* (2014) [20] in the Eastern desert, Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

Scrophulariaceae

***18. Plantago lanceolata* L.**

N [1]

Transferred to **D** as recorded by (SCU-I) Herbarium sheet, Hassanen *et al.* (2022) [27] in Ismailia city

***19. Plantago major* L.**

N [1]

Transferred to **De, R** as recorded by Abd El-Ghani *et al.* (2014) [20] in the Eastern desert,

Abd El-Hamid (2017) [24] in Suez, Hassanen *et al.* (2022) [27] in Ismailia-Suez highway

***20. Veronica anagaIlis-aquatica* L.**

N, O [1]

Transferred to **M** as recorded by Shaltout and Galal (2007) [17] in lake Manzala

Serag *et al.* (2015) [21] in Damietta area, Hassanen *et al*. (2022) [27] in Ismailia- Portsaid highway

Solanaceae

***21. Datura stramonium* L.**

N [1]

Transferred to **M, De, D** as recorded Abd El-Ghani *et al.* (2014) [20] in the Eastern desert, Bidak *et al.* (2013) [19] and Shaltout *et al.* (2015) [17] in Western Mediterranean Coastal Region,

Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway, Ismailia city and Ismailia-Suez highway

***22. Datura innoxia* Mill.**

N [1]

Transferred to **M, De, D** as recorded by Abd El-Hamid (2017) [24] in Ismailia Canal, Shaltout *et al.* (2015) [22] in Western Mediterranean Coastal Region, Hamdy *et al.* (2017) [23] in Ismailia-Suez highway, Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway, Ismailia city and Ismailia-Suez highway

Commelinaceae

***23. Commelina bengnalensis* L.**

N, GE [1]

Transferred to **M**, **D** as recorded by Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway,

El Bous and Abd El-Hamid (2018) [26] in Ismailia Governorate,

Poaceae

***24. Cenchrus biflorus* Roxb.**

N, D, S [1]

Transferred to **M** as recorded by Mashaly *et al.* (2002) [15] in Damietta area Abd El-Hamid and Kamel (2010) [18] in El-Tina plain, Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway

***25. Chloris virgata* Sw.**

N, O, GE [1]

Transferred to **D** as recorded by Hassanen *et al.* (2022) [27] in Ismailia city and collected by Wafaa M. Kamel from Nemra 6 street, Ismailia city at 19/1/1992 (SCU-I Herbarium sheet).

26. Leptochola panicea (Retz.) Ohwi.

N [1]

Transferred to **M** as recorded by Abd El-Hamid and Kamel (2010) [18] in El-Tina plain, Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway

***27. Setaria viridis* (L.) Beauv**

N, O, De, S [1]

Transferred to **D** as recorded by Abd El-Hamid (2005) [16] in Ismailia governorate, Mohamed and Azer (2012) [25] in Ismailia Canal

***28. Triticum aestivum* L.**

N [1]

Transferred to **M, D** as recorded by Abd El-Hamid (2005) [16] in Ismailia governorate, Mohamed and Azer (2012) [25] in Ismailia Canal, Hassanen *et al.* (2022) [27] in Ismailia- Portsaid highway

4. DISCUSSION

Capsella bursa-pastoris, Leptochola panicea, Datura stramonium, Datura innoxia, Plantago lanceolata, Plantago major and *Triticum aestivum* shifted from Nile region to other regions. The reasons for this may be due to the connection of the Nile region to the Mediterranean Sea. Moreover, it divides the deserts of Egypt into two separate geomorphological regions: the Eastern desert and Western desert [28]. However, in the case of genus *Datura* that had been newly recorded in Suez Canal region may be due to the growth of region's population and expansion of green spaces. The new habitats created by the enlarged towns have transferred taxa from the Nile valley to the Suez Canal's west bank [29]. *Commelina benghalensis* belonged to Gebel Elba according to Boulos (2009) [1] but, there are no relation between Gebel Elba and Mediterranean region where this species transferred. The reason for this may be due to the international trade and agriculture that enabled the spreading of species across their natural dispersal barriers. Some genera may spread to these new localities via soil and organic fertilizers e.g., *Amaranthus, Chenopodium, Trianthema, Euphorbia* (they have small seeds). In addition, air transport is possible for *Cynanchum acutum* as the seeds have long and soft hairs. Moreover, *Setaria viridis* and *Cenchrus biflorus* may be dispersed by human and animal agents.

5. CONCLUSION

The present study updates the geographical distribution of 28 species, belonged to 24 genera and 14 families. The new distribution of these species is confirmed through correcting their distribution ranges based on the new information.

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