Floristic composition and plant diversity of Rawdhat Al Masodi, Saudi Arabia

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Abstract. Although there is quite high number of studies aiming to survey the floristic diversity in Saudi Arabia, there is still lacking of complete compilation of the floristic diversity in this region. The present study is considered as another effort to investigate the floristic diversity, life forms and phytogeographical distribution of plant species in Rawdhat Al Masodi which is located about 120km from capital Riyadh. A total of 51 species belonging to 49 genera and 25 families were reported in this study. Astraceae and Poaceae had the highest number of species (11 and 5 species, respectively). The dominant life forms were life form spectrum of the recorded species showed the prevalence of theophytes (41%) followed by chamaephytes (37%). Chorology indicated prevalence of the monoregion species in which most of species identified as Saharo-Arabian (SA), Irano-Turanian (IT) and Sudanean (SU). In conclusion, the Rawdhat Al Masodi harbouring high diversity of vascular plant species. Unfortunately, this area is currently under the stress of wood-cutting, urbanization and unorganized grazing. Therefore, it is recommended to start a conservational programs and restoration of the natural habitats in this area.

Keywords: plant species, Rawdhat Al Masodi, life forms, chorotypes.

Introduction

Flora refers to the wild plants occurring in a specific region/area. The plant species are sustainable source for various medicinal and pharmaceutical products besides their specific use as a food and raw materials for building houses (Shehata and Galal, 2014). The plant species plays a vital role in modern environmental management through sustainable exploitation of the natural resources (i.e. plants) and maintaining the natural biodiversity minimally impacted (Kandi et al., 2011). The main purpose of the floristic surveys is to provide baseline information about the plant species grown in a

specific area with emphasis on their distribution. The information will eventually facilitate any future conservation efforts.

Despite their low annual rainfall, arid and semi-arid regions are considered as remarkable hot spot for floristic biodiversity (Alsherif et al., 2013). Saudi Arabia occupies large area of the Arabian Peninsula and characterised with unique diversity of habitats and environments. The central part of Saudi Arabia features unique example of diversity of both annual and perennial plants (Al-Nafie, 2008; El-Sheikh et al. 2013). Although these plants are well-adapted for the arid environment, the biodiversity of these natural

resources are threatened by intensive development, wood-cutting and grazing in addition to other human activities such as recreational activities and road construction (Barakat et al. 2014; Al-Mutairi et al., 2015; Hatim et al. 2016; Al-Mutairi, 2017).

Despite the large number of floristic published studies (see Migahid 1996, Collenette 1999; Chaudhary 1999; Chaudhary 2001) and more recent studies such as Al-Turki (1997), Al-Turki and Al-Olyan (2003) and El-Ghanim et al. (2010) and Al-Mutairi et al. (2016), there is still scarcity in the information about the diversity and distribution of plants in Saudi Arabia. This is due the fact that Saudi Arabia is large (~2.25 million km²). In addition to this, the climate varies significantly from the north to the South and from the East to the West and this creates diverse habitats and environments which results in diversity in plant communities (Al-Nafie, 2008; El-Sheikh et al. 2013).

The plant communities in Arabian Peninsula especially in Saudi Arabia are threatened by anthropogenic activities and urbanization (Khalik et al. 2013; Al-Mutairi et al., 2015). Although there is a quite high number of studies aimed to investigate the plant communities in several parts of Saudi Arabia, the plant biology and ecology in Saudi Arabia is incompletely understood. The present study aims to describe the floristic diversity in Rawdhat Al Masodi in Saudi Arabia.

Materials and Methods

Study site

The present study was carried out in Rawdhat Al Masodi which is situated about 120km from the capital Riyadh. The Rawdhat Al Masodi is characterised with unique plant species communities due its location in the middle of East and North part of Arabian Peninsula. Similar to the most regions of Saudi Arabia, Rawdhat Al Masodi characterised with low annual precipitation

which is always less than 200mm/year. The temperature varies significantly between summer and winter seasons. The temperature vary from 43C in summer to less than 7C during winter time.

Sampling of plant species

The plant species were surveyed in this region using the 10x10 m stands following the standard procedures as described in several studies (see Al-Mutairi et al., 2016). The vascular plant species occurred inside the stand were counted and identified following the available keys of Chaudhary (2001) and Collenette (1999).

The phytogeographical classification was conducted using the keys of Zohary (1973) and Al-Nafie (2008) as well as previously described in Al-Mutairi et al. (2016). The life forms identification was performed following the reference of White and Lionard (1991) which has been proven to be adequate guide for plant species in Arabian Peninsula.

Results and discussion

A total of 51 plant species belongs to 49 genera and 25 families. The annual plant species comprises 49% and perennials comprise 51%. As shown in Figure 1, the families of Asteraceae and Poaceae were the most dominant families with the highest number of species (11 and 5 species, respectively).

The number of vascular plant species reported in this study was lower than what has been recorded in the Northern part of Saudi Arabia such as Tabuk (Al-Mutairi et al., 2016) Hail and other northern parts (El-Ghanim et al., 2010; Al-Olyan, 2003, Osman et al., 2014). Asteraceae was reported to be the dominant family with total number of species of 11. This is in general with coincidence of previous reports such as Seraj et al. (2014) and Al-Mutairi et al. (2016) in various parts of Saudi Arabia

Figure 1: Percentage of plant species in families in Rawdhat Al Masodi, Saudi Arabia.

As summarized in Table 1, Rawdhat Al Masodi supported high plant diversity which comprised almost 20% of the total number of species reported, so far, in Saudi Arabia. The generic coefficient was 1.04 compared to 2.72 for the entire Saudi Arabia.

Table 1. Comparison of floristic diversity in Rawdhat Al Masodi (present study) to the plant diversity in the entire Saudi Arabia.

Location	Family	Genera	Species	Generic coefficient
Rawdhat Al Masodi (present study)	25	49	51	1.04
Saudi Arabia Chaudhary (1999- 2001)	129	816	2223	2.72
Percentage (%)	19.38	6	2.29	

The life form analysis is known for its importance in providing supplementary information which facilitates understanding the complex interaction of plant species with abiotic and biotic factors in the surrounding environment (Ayyad and El-Ghareeb, 1982). Figure (1) presented the life forms of plant species in Rawdhat Al Masodi. It is clearly shown that therophytes and chemophytes are the dominant life forms, while, phanerophytes

comprised the lowest percentage of life form types. The present findings are in the line with other related studies such as Osman et al. (2014) and Seraj et al. (2014). This can be explained by the prevalence of the Mediterranean climate (Mobayen 1996). Moreover, therophytes are known for their high adaptability to arid environment (Asri, 2003) which is the main feature of Rawdhat Al Masodi.

Figure 2. Life form spectrum of the recorded species in Rawdhat Al Masodi, Saudi Arabia. PH: Phanerophytes, CH: Chamaephytes, HE: Hemicryptophytes, GE: Geophytes, TH: Therophytes.

The chorology of plant species in Rawdhat Al Masodi is shown in Figure 2. The monoregional plant species were the most dominant compared to bioregional and pluriregional species. Most of plant species in Rawdhat Al Masodi are belong to Saharo-Arabian, Irano-Turanian and Sudanian

regions. This is obviously in agreement with most of studies conducted in Saudi Arabia (see Alharbi, 2010 and Al-Mutairi et al., 2016). Al Sherif et al. (2013) reported that Saharo-Arabian and Sudanian plant species showed the greatest composition of the total flora in the West of Saudi Arabia.

Figure 3. Chorotype analysis of the rcored species in Rawdhat Al Masodi, Saudi Arabia. SU =Sudanean, SA = Saharo-Arabian, IT = Irano-Turanian, ME = Mediterranean. Cosm = Cosmopolitan. Others include Saharo-Arabian- Mediterranean-Euro-Siberian and Saharo-Arabian-Tropical-Sudanean.

Conclusion

The present study studied the floristic composition, phytogeographical distribution and life forms of vascular plants in Rawdhat Al Masodi. The present study reported 51

plant species in this region which can be considered as one of the moderately diverse areas of Saudi Arabia. Further ecological studies should be carried out in the future to better understand the ecological interaction

between plant species and physical and chemical variables in Rawdhat Al Masodi. Moreover, the conservation programs should

be designed and implemented in order to protect the natural biodiversity of this region.

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تكوين الأزهار والتنوع النباتي في روضة المسعودي، المملكة العربية السعودية

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مستخلص. على الرغم من وجود عدد كبير جداً من الدراسات التي تهدف إلى مسح التنوع الزهري في المملكة العربية السعودية، لا يزال هناك نقص في مجموعة كاملة من التنوع الزهري في هذه المنطقة. تعتبر هذه الدراسة محاولة أخرى لاستكشاف التنوع الزهري وأشكال الحياة والتوزيع الجغرافي للنباتات في روضة المسعودي التي تقع على بعد حوالي ١٢٠ كم من العاصمة الرياض. تم الإبلاغ عن ما مجموعه ٥١ نوعاً ينتمون إلى ٤٩ جنساً و ٢٥ أسرة في هذه الدراسة. كان لأستراليا وبوسيا أكبر عدد من الأنواع (١١ و ٥ أنواع على التوالي). كانت أشكال الحياة المهيمنة هي طيف شكل الحياة من الأنواع المسجلة وأظهرت انتشار الثيروفايتس (٤١%) تليها الكامفايتس (٣٧%). أشارت الجغرافيا البيولوجية إلى انتشار الأنواع ذات المنطقة الواحدة التي حددت فيها معظم الأنواع بانتمائها للصحراء العربية (SA) والإيرانية-التورانية (IT) والسودانية (SU). في الختام، تضم روضة المسعودي تنوعاً كبيراً من أنواع النباتات الوعائية. لسوء الحظ، تخضع هذه المنطقة حالياً لضغوط قطع الأشجار والتحضر والرعي غير المنظم. لذلك، يوصى ببدء برامج الحفظ واستعادة البيئات الطبيعية في هذه المنطقة.