



## Computer-Generated Keys and Descriptions of the Flora of Saudi Arabia: A Pilot Study on Some Grasses from Jazan

Adel El-Gazzar<sup>(1)#</sup>, Aishah S. Al-Ameri<sup>(2)</sup>, Lamiaa Farouq Shalabi<sup>(2,3)</sup>

<sup>(1)</sup>Faculty of Science, El-Arish University, El-Arish, N. Sinai, Egypt; <sup>(2)</sup>Biology Department, Faculty of Science, Jazan University, Jazan, Saudi Arabia; <sup>(3)</sup>Department of Biological Sciences, Faculty of Education, Ain Shams University, Cairo, Egypt.



**T**HIS IS THE FIRST use of computer programs to construct keys and descriptions of plants in the flora of Saudi Arabia or any other country in the Arabian Peninsula. The program suit DELTA was used to generate a conventional key to 55 species of Poaceae collected from Jazan region, Saudi Arabia, on the basis of a dataset comprising 50 easily observable morphological characters. Together with the key, the outcome of the computer run includes descriptions for individual species in natural language based on the entirety of the 50 characters recorded for every species to be used in the confirmation of its identity. The computer-generated key avoids the numerous inconsistencies encountered frequently in its traditional counterparts, and can easily be regenerated to accommodate additional taxa and/or characters. This study was undertaken as a model for other studies aiming at improving floristic studies in Saudi Arabia and the procedure adopted here is equally applicable to all other groups of wild and cultivated plants in the the country.

**Keywords:** Conventional key, DELTA, Descriptions, Identification, Jazan, Poaceae, Saudi Arabia.

### Introduction

Floristic exploration of the Arabian Peninsula dates as far back as 1800 BC, but the scientific approach to studying the flora of Arabia did not start until late in the 19<sup>th</sup> century AD (Blatter, 1933; Batanouny, 1978; Rahim, 1979). This approach was heralded by the numerous collecting expeditions which resulted in the preparation of comprehensive inventories by several European botanists (e.g. Schweinfurth, 1894-1899; Blatter, 1919, 1921a, 1921b, 1923, 1936; Schwartz, 1939). This phase in the history of the flora of Arabia was later followed by more detailed studies of the flora of individual countries of the Peninsula which also included identification keys leading to the scientific names of plants.

The Kingdom of Saudi Arabia (KSA) occupies the largest area of the Arabian Peninsula, and is endowed with nearly every conceivable

habitat type together with an equally diversified vegetation (Zahran, 1982, 1983). Accurate identification of taxa in this rich flora necessitated the construction of traditional keys which were usually accompanied by brief descriptions of taxa as an aid in the confirmation of identifications made by using these keys. Major studies of this kind are exemplified by the books of Migahid (1988-1990) and Chaudhary (1999, 2000) on the flora of the entire country, the other publications dealing with limited regions thereof (e.g. Chaudhary & Zawawi, 1983; Mandaville, 1990), and those which were limited to only the weed flora (e.g. Chaudhary & Akram, 1987). As an aid in botanical identification, pictorial accounts of numerous species were provided by Abulfatih (1984), Lipscombe Vincett (1977, 1984) and Collenette (1985). All of these studies served numerous teaching and research purposes: had it not been for these floristic treatments, work in other botanical disciplines would not have

#Corresponding author email: [elgazzar\\_adel@hotmail.com](mailto:elgazzar_adel@hotmail.com)

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been possible. Suffice it here to mention that the innumerable subsequent ecological studies in various parts of the country (e.g. Al-Turki & Al-Qlayan, 2003; Alfarhan et al., 2005; Al-Huquial & Al-Turki, 2006; Alatar et al., 2012; Osman et al., 2014; Salman, 2015; Masrahi et al., 2017; Alghanem et al., 2020) have resorted to the keys and descriptions in these floristic studies for the identification of plants from all parts of the country. However, identification keys in all of these studies were invariably manually constructed.

Much as the manually constructed identification keys have served important purposes in their time, they leave much to be desired (El-Gazzar, 1976). The advent of computer programs designed specifically for the construction of conventional and interactive identification keys lead to the obviation of most of the common drawbacks of traditional keys. These programs have varying degrees of mathematical sophistication, accuracy, ease of use, capacity, and limitations on character types. Examples of such programs include Pankey (Pankhurst, 1970, 1986), DELTA (Dallwitz et al., 1993 onwards; Dallwitz & Paine, 2005; Dallwitz 2010), Xkey (Calvo-Flores et al., 2006), SIKey (Zhang et al., 2008), and the program described by Reynolds et al. (2003).

The DELTA package was applied successfully to the flora of several countries and to the genera and species of numerous families. For example, applications of this method to the flora of Egypt include studies on the Mimosoideae and Caesalpinioideae of the Leguminosae (El-Gazzar et al., 2008a), the Chenopodiaceae (El-Gazzar et al., 2008b), the Plantaginaceae (El-Gazzar et al., 2009a), the Solanaceae (El-Gazzar et al., 2009b), the Leguminosae-Papilionoideae (El-Gazzar et al., 2012), the Boraginaceae (El-Gazzar et al., 2015a), the Acanthaceae (El-Gazzar et al., 2015b), the Lamiaceae (El-Gazzar et al., 2019b), and the Asteraceae (El-Gazzar et al., 2019a, 2020). A list of the numerous applications of the DELTA suite of programs to various groups of plants, animals and micro-organisms in other parts of the world is given by Dallwitz (1993 onwards).

According to Thomas (2011 onwards), the Poaceae are the largest angiosperm family in the flora of KSA with 105 genera encompassing 273 species and a few infra-specific taxa. They were

previously keyed out only by Cope (1985) among the rest of the grasses in the Arabian Peninsula and later by Chaudhary (1989) who dealt only with those of Saudi Arabia.

As an attempt to improve the keys to the flora of KSA, we have embarked upon the present pilot study to benefit from the inherent advantages of the DELTA computer program suit with a limited collection of the more common grasses in Jazan region so that it might inspire taxonomists to extend its application to the entire Poaceae and other families in the flora of Saudi Arabia.

### **Materials and Methods**

The present study is based on specimens of 55 species belonging to 31 genera of the Poaceae. About 26 field trips were conducted from mid-November 2018 to April 2020 and fresh specimens representing each species were collected from one to six different localities in Jazan region with variable soil types and at different altitudes in order to cover as many habitat types as possible and the ensuing variation in plant characters caused by differences in habitat conditions. All specimens are kept as voucher material in the herbarium of Faculty of Sciences, Jazan University (JAZUH). Identification of all specimens was performed with the help of local floras of Saudi Arabia and some neighboring countries (Bor, 1968; Abulfatih, 1984; Collenette, 1985; Cope, 1985; Migahid, 1988-1990; Chaudhary, 1989-2000; Chaudhary & Akram, 1987; Chaudhary & Zawawi, 1983; Mandaville, 1990; Boulos, 2005; Alfarhan et al., 2005; Alatar et al., 2012; Masrahi, 2012).

A dried part of the culm and inflorescence was resuscitated in boiling water, and a few spikelets were dissected on a slide and examined under a binocular microscope. Measurements were made using a digital caliper and (when necessary) a stereoscope. A total of 50 characters were recorded comparatively for each of the 55 species in a data matrix prior to being subjected to numerical analysis under the computer program package DELTA version 1.04 for Windows (Dallwitz, 1993 onwards, 2010; Dallwitz et al., 1993 onwards; Dallwitz & Paine, 2005). The standard illustrated glossary of botanical terms by Stearn (1966) was used to avoid any ambiguities in the interpretation of terms used in the present study to describe the characters and their states.

## Results

### The character list

Available specimens of the 55 taxa of Poaceae exhibited variation in 50 characters of gross vegetative and floral morphology (Table 1). States of the 50 characters were defined so that they can be easily recognized by users of the computer-generated key with as little visual aid as a hand lens or simple microscope.

### Item descriptions

These are the original data matrix presented in the DELTA format whereby each character and its state in a given species are represented by the numbers assigned to them in Table 1 and separated by a comma.

# \bi{Aeluropus lagopoides \i0}{(L.) Thwaites}\b0{/

1,2 2,2 3,7-13 4,2 5,1 6,1 7,3 8,2 9,3 10,1.5-3.5 11,1-1.5 12,2 13,5 14,1 15,2 16,1 17,2 18,1 19,3 20,2 21,2 22,2 23,3 24,3 25,2 26,2 27,1 28,1.5-3.5 29,1 30,1-2 31,2 32,2 33,2.5-3 34,4 35,1 36,2 37,2-2.5 38,1 39,3 40,1 41,1 42,2 43,1.5-2 44,1 45,3 46,3 47,1 48,1 49,1 50,0

# \bi{Aristida adscensionis \i0}{L.}\b0{/

1,1 2,1 3,65-77 4,1 5,1 6,1 7,1 8,1 9,2 10,25-44 11,1-2.5 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1 20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,1 28,27-46 29,1 30,8-11 31,1 32,2 33,6-8 34,1 35,1 36,1 37,5-6.5 38,1 39,1 40,1 41,1 42,1 43,3.5-6 44,1 45,1 46,1 47,2 48,3 49,1 50,15-19

# \bi{Aristida mutabilis \i0}{Trin. & Rupr.}\b0{/

1,1 2,2 3,35-40 4,1 5,1 6,1 7,1 8,1 9,2 10,5-9 11,1-1.5 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1 20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,1 28,14-20 29,1 30,6-12 31,1 32,2 33,5-7 34,1 35,1 36,1 37,4-6 38,1 39,1 40,1 41,1 42,1 43,2.5-3.5 44,1 45,1 46,2 47,3 48,1 49,1 50,16-24

# \bi{Bothriochloa radicans \i0}{(Lehm.) A. Camus}\b0{/

1,2 2,1 3,85-105 4,1 5,1 6,1 7,1 8,1 9,1 10,15-26 11,2-4 12,1 13,1 14,1 15,2 16,1 17,2 18,2 19,1 20,1 21,2 22,2 23,3 24,2 25,1 26,1 27,1 28,6-8 29,1 30,4-7 31,1 32,2 33,2-3.5 34,1 35,2 36,1 37,4-5 38,1 39,1 40,1 41,1 42,1 43,3.5-5 44,1 45,1 46,1 47,2 48,1 49,1 50,20-26

# \bi{Brachiaria leersioides \i0}{(Hochst.) Stapf}\b0{/

1,1 2,3 3,30-38 4,1 5,1 6,1 7,1 8,1 9,1 10,9-12 11,3-7 12,1 13,2 14,1 15,2 16,1 17,2 18,2 19,1 20,1 21,1 22,2 23,3 24,1 25,1 26,1 27,1 28,12-18 29,1 30,3-8 31,1 32,2 33,3-4 34,4 35,3 36,3 37,2-3 38,1 39,1 40,3 41,1 42,3 43,0.5-1 44,1 45,1 46,3 47,2 48,1 49,1 50,0

# \bi{Cenchrus biflorus \i0}{Roxb.}\b0{/

1,1 2,2 3,18-20 4,1 5,1 6,2 7,1 8,1 9,2 10,3-4 11,2-3 12,1 13,5 14,2 15,1 16,2 17,1 18,3 19,1 20,2 21,1 22,1 23,3 24,1 25,1 26,1 27,1 28,6-8 29,3 30,2-3.5 31,2 32,2 33,2.5-5 34,4 35,1 36,3 37,2-3 38,1 39,1 40,3 41,1 42,3 43,1-2.5 44,1 45,1 46,3 47,2 48,1 49,1 50,0

# \bi{Cenchrus ciliaris \i0}{L.}\b0{/

1,2 2,2 3,72-95 4,1 5,1 6,2 7,1 8,1 9,1 10,6-22 11,2-4 12,1 13,5 14,2 15,1 16,2 17,1 18,3 19,1 20,2 21,1 22,1 23,3 24,1 25,1 26,1 27,1 28,10-18 29,3 30,3-10.5 31,2 32,2 33,3-5 34,1 35,3 36,1 37,2-3.5 38,1 39,1 40,1 41,2 42,1 43,1-2 44,1 45,1 46,1 47,2 48,1 49,1 50,0

# \bi{Cenchrus echinatus \i0}{L.}\b0{/

1,1 2,2 3,90-115 4,1 5,1 6,2 7,1 8,1 9,1 10,4-12 11,2-4 12,1 13,5 14,2 15,2 16,2 17,2 18,1 19,1 20,2 21,1 22,1 23,3 24,1 25,1 26,1 27,1 28,7-20 29,1 30,3.5-9 31,2 32,2 33,5-7 34,1 35,3 36,1 37,3-4 38,1 39,1 40,1 41,2 42,1 43,1.5-2 44,1 45,1 46,1 47,2 48,1 49,1 50,0

# \bi{Cenchrus pennisetiformis \i0}{Steud.}\b0{/

1,1 2,2 3,31-68 4,1 5,1 6,2 7,1 8,1 9,1 10,3-10 11,2-4 12,1 13,5 14,2 15,1 16,2 17,1 18,2 19,1 20,2 21,1 22,1 23,3 24,1 25,1 26,1 27,1 28,12-19 29,3 30,5-13 31,2 32,2 33,3-5 34,1 35,3 36,2 37,3-4.5 38,1 39,1 40,1 41,2 42,2 43,2-3 44,1 45,1 46,1 47,2 48,1 49,1 50,0

# \bi{Cenchrus setigerus \i0}{Vahl}\b0{/

1,2 2,2 3,46-85 4,1 5,1 6,2 7,1 8,1 9,1 10,5-10 11,1-4 12,1 13,5 14,2 15,1 16,2 17,1 18,2 19,1 20,2 21,1 22,1 23,3 24,1 25,1 26,1 27,1 28,7-13 29,3 30,3.5-6 31,2 32,2 33,3.5-5 34,1 35,3 36,1 37,3-4 38,1 39,1 40,1 41,2 42,1 43,1.5-2 44,1 45,1 46,1 47,2 48,1 49,1 50,0

# \bi{Chloris barbata \i0}{Sw.}\b0{/

1,2 2,2 3,70-89 4,1 5,1 6,1 7,1 8,1 9,1 10,4-12 11,2-4 12,1 13,5 14,2 15,1 16,1 17,2 18,1 19,1 20,2 21,2 22,2 23,3 24,3 25,2 26,1 27,1 28,8-26 29,1 30,13-20 31,2 32,2 33,2.5-3 34,1 35,1 36,1 37,1.5-2 38,1 39,1 40,1 41,1 42,1 43,0.5-1 44,1 45,1 46,2 47,2 48,1 49,2 50,5-8

**TABLE 1. List of 50 characters and their character-states recorded comparatively for 55 species representing 31 genera of the Poaceae in Jazan Region, Saudi Arabia**

#1. Plant/ 1. annual/ 2. perennial/	#19. Sheath/ 1. shorter than internode/ 2. equal to internode/ 3. longer than internode/	#36. Upper glume/ 1. cream-coloured/ 2. green/ 3. brown/
#2. Plant/ 1. yellow/ 2. green/ 3. brown/ 4. reddish brown/	#20. Sheath surrounding internode/ 1. completely/ 2. partially/	#37. Upper glume length/ mm/
#3. Plant height/ cm/	#21. Sheath veins/ 1. prominent/ 2. not prominent/	#38. Upper glume tip/ 1. acute-acuminate/ 2. awned/ 3. obtuse/
#4. Culm/ 1. erect/ 2. creeping/ 3. runner/	#22. Sheath tip/ 1. auriculate/ 2. not auriculate/	#39. Upper glume margin/ 1. entire/ 2. scabrous/ 3. villous/
#5. Culm/ 1. glabrous/ 2. hairy/	#23. Sheath colour/ 1. lighter than culm/ 2. darker than culm/ 3. same as culm/	#40. Lower glume/ 1. lanceolate/ 2. elliptic/ 3. ovate/
#6. Culm/ 1. cylindrical/ 2. angled/	#24. Ligule/ 1. a tuft of hairs/ 2. glabrous/ 3. hairy/ 4. absent/	#41. Lower glume/ 1. glabrous/ 2. membranous/ 3. hairy/ 4. spinulose/
#7. Node/ 1. black/ 2. light brown/ 3. not coloured/	#25. Inflorescence/ 1. simple spike/ 2. dense spike-like panicle/ 3. open spike-like panicle/	#42. Lower glume/ 1. cream-coloured/ 2. green/ 3. brown/
#8. Leaf blade/ 1. linear/ 2. lanceolate/	#26. Inflorescence/ 1. elongate/ 2. globose/ 3. digitate/	#43. Lower glume length/ mm/
#9. Leaf blade/ 1. flat/ 2. folded/ 3. rolled/	#27. Inflorescence/ 1. yellow/ 2. brown/ 3. green/	#44. Lower glume tip/ 1. acute-acuminate/ 2. obtuse/
#10. Leaf blade length/ cm/	#28. Inflorescence length/ cm/	#45. Lower glume margin/ 1. entire/ 2. scabrous/ 3. hairy/
#11. Leaf blade width/ cm/	#29. Peduncle/ 1. glabrous/ 2. hairy/ 3. scariosus/	#46. Lemma/ 1. linear/ 2. elliptic/ 3. ovate/
#12. Leaf blade apex/ 1. acute-acuminate/ 2. pungent/ 3. filiform/	#30. Peduncle length/ cm/	#47. Lemma/ 1. cream-coloured/ 2. green/ 3. brown/
#13. Leaf blade margin/ 1. with hooked appendages/ 2. spiny/ 3. with hispid papillae/ 4. hairy/ 5. smooth/	#31. Number of florets per spike/ 1. 1/ 2. 2–9/ 3. 10 or more/	#48. Lemma/ 1. glabrous/ 2. hairy/ 3. scabrid/
#14. Leaf blade upper surface/ 1. glabrous/ 2. hairy/	#32. Spikelets/ 1. sessile/ 2. pedicelled/ 3. sessile and pedicelled/	#49. Lemma/ 1. shorter than glumes/ 2. longer than glumes/
#15. Leaf blade upper surface/ 1. scariosus/ 2. rigid/	#33. Spikelet length/ mm/	#50. Awn length/ mm/
#16. Leaf blade lower surface/ 1. glabrous/ 2. hairy/	#34. Upper glume/ 1. linear/ 2. oblong/ 3. elliptic/ 4. ovate/	
#17. Leaf blade lower surface/ 1. scariosus/ 2. rigid/	#35. Upper glume/ 1. glabrous/ 2. villous/ 3. membranous/ 4. spinulose/	
#18. Sheath/ 1. glabrous/ 2. hairy/ 3. coriaceous/		

- # \bi{}Chloris virgata \i0{}Sw.\b0{}/  
1,1 2,2 3,70-96 4,1 5,1 6,2 7,1 8,1 9,1 10,24-35  
11,4-5 12,1 13,5 14,2 15,1 16,2 17,1 18,1 19,1  
20,2 21,2 22,1 23,3 24,3 25,2 26,1 27,1 28,14-  
30 29,1 30,8-22 31,2 32,2 33,2-3 34,1 35,1 36,1  
37,2.5-4 38,1 39,1 40,1 41,1 42,1 43,1-2 44,1 45,1  
46,3 47,1 48,1 49,2 50,3.5-4
- # \bi{}Cynodon dactylon \i0{}L.\b0{}/  
1,2 2,2 3,34-60 4,3 5,1 6,1 7,2 8,1 9,1 10,3-8 11,1-  
3 12,1 13,5 14,1 15,2 16,2 17,2 18,1 19,1 20,2  
21,1 22,1 23,2 24,1 25,3 26,1 27,1 28,6-8 29,1  
30,1-3 31,1 32,2 33,1.5-2.5 34,1 35,1 36,1 37,1.5-  
2.5 38,1 39,1 40,1 41,1 42,1 43,1-1.5 44,1 45,1  
46,3 47,2 48,1 49,2 50,0
- # \bi{}Dactyloctenium aegyptium \i0{}(L.)  
Willd.\b0{}/  
1,1 2,2 3,37-60 4,1 5,1 6,1 7,2 8,1 9,1 10,5-15  
11,3-5 12,1 13,5 14,2 15,1 16,2 17,1 18,1 19,1  
20,2 21,1 22,1 23,3 24,1 25,2 26,1 27,1 28,11-20  
29,1 30,8-17 31,2 32,2 33,2.5-3 34,3 35,1 36,1  
37,2-2.5 38,2 39,1 40,1 41,1 42,1 43,1-2 44,1 45,1  
46,3 47,2 48,1 49,2 50,0
- # \bi{}Dactyloctenium aristatum \i0{}Link\  
b0{}/  
1,1 2,2 3,41-53 4,1 5,1 6,1 7,1 8,1 9,1 10,8-13  
11,1-3 12,1 13,3 14,2 15,2 16,2 17,2 18,1 19,1  
20,2 21,1 22,1 23,2 24,1 25,2 26,1 27,1 28,9-18  
29,1 30,8-16 31,2 32,2 33,2.5-3 34,3 35,1 36,1  
37,2-2.5 38,2 39,1 40,1 41,1 42,1 43,1-2 44,1 45,1  
46,3 47,2 48,1 49,2 50,0
- # \bi{}Dactyloctenium scindicum \i0{}Boiss.\  
b0{}/  
1,2 2,2 3,31-55 4,1 5,1 6,1 7,1 8,1 9,1 10,1-4 11,1-  
2 12,1 13,3 14,1 15,2 16,1 17,2 18,1 19,1 20,2  
21,1 22,1 23,3 24,1 25,2 26,1 27,1 28,9-18 29,1  
30,7.5-16 31,2 32,2 33,2-3 34,3 35,1 36,1 37,1.5-  
2 38,2 39,1 40,1 41,1 42,1 43,0.5-1 44,1 45,1 46,1  
47,2 48,1 49,2 50,0
- # \bi{}Dichanthium foveolatum \i0{}(Delile)  
Roberty\b0{}/  
1,2 2,2 3,33-55 4,1 5,1 6,1 7,3 8,1 9,1 10,4-7  
11,1-2 12,1 13,5 14,1 15,2 16,1 17,2 18,3 19,1  
20,1 21,1 22,1 23,2 24,1 25,1 26,1 27,1 28,8-14  
29,3 30,4.5-10 31,2 32,3 33,3.5-4 34,2 35,1 36,1  
37,3.5-4 38,1 39,1 40,1 41,1 42,1 43,3.5-4 44,1  
45,1 46,3 47,1 48,1 49,1 50,12-16
- # \bi{}Digitaria ciliaris \i0{}(Retz.) Koeler\b0{}/  
1,1 2,2 3,30-60 4,1 5,1 6,1 7,1 8,1 9,1 10,3-7 11,2-  
5 12,1 13,1 14,2 15,1 16,2 17,1 18,1 19,1 20,2  
21,1 22,1 23,2 24,1 25,3 26,3 27,1 28,16-25 29,1  
30,7-17 31,1 32,1 33,0 34,1 35,1 36,1 37,3.5-4  
38,1 39,1 40,1 41,3 42,1 43,2.5-3 44,1 45,3 46,1  
47,2 48,1 49,1 50,0
- # \bi{}Echinochloa colona \i0{}(L.) Link\b0{}/  
1,1 2,3 3,26-58 4,2 5,1 6,1 7,2 8,1 9,1 10,5-9 11,3-  
5 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1 20,2  
21,2 22,2 23,2 24,4 25,3 26,1 27,2 28,8.5-17 29,1  
30,4-15 31,1 32,2 33,1.5-2.5 34,3 35,4 36,2 37,2-  
2.5 38,1 39,1 40,1 41,4 42,2 43,0.5-1 44,1 45,1  
46,2 47,1 48,3 49,1 50,0
- # \bi{}Eleusine indica \i0{}(L.) Gaertn.\b0{}/  
1,1 2,2 3,24-45 4,1 5,1 6,1 7,3 8,1 9,2 10,5-9  
11,1.5-2 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,2 23,2 24,1 25,3 26,3 27,1 28,11-  
25 29,1 30,5-17 31,2 32,2 33,6-9 34,1 35,1 36,1  
37,4.5-6 38,1 39,1 40,1 41,1 42,1 43,4-5 44,1 45,1  
46,1 47,2 48,1 49,1 50,0
- # \bi{}Enneapogon desvauxii \i0{}P. Beauv.\  
b0{}/  
1,1 2,2 3,35-40 4,1 5,1 6,1 7,2 8,1 9,1 10,2-4  
11,1.5-3 12,1 13,5 14,2 15,1 16,2 17,1 18,1 19,1  
20,2 21,2 22,2 23,2 24,1 25,2 26,1 27,2 28,10-17  
29,1 30,6-12 31,2 32,2 33,4.5-6 34,1 35,1 36,2  
37,5-6 38,1 39,1 40,1 41,1 42,2 43,4-5 44,1 45,1  
46,3 47,1 48,2 49,2 50,0
- # \bi{}Enneapogon persicus \i0{}Boiss.\b0{}/  
1,1 2,2 3,40-57 4,1 5,1 6,1 7,2 8,1 9,2 10,4-13  
11,1-2 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,2 23,3 24,1 25,2 26,1 27,2 28,13-22  
29,1 30,4-12 31,2 32,2 33,6.5-9 34,1 35,1 36,2  
37,6-9 38,1 39,1 40,1 41,1 42,2 43,5-7 44,1 45,1  
46,3 47,1 48,2 49,2 50,0
- # \bi{}Eragrostis barrelieri \i0{}Daveau\b0{}/  
1,1 2,2 3,38-53 4,1 5,1 6,1 7,1 8,1 9,1 10,4-12  
11,1-2 12,1 13,5 14,1 15,2 16,2 17,1 18,1 19,1  
20,2 21,1 22,2 23,2 24,1 25,2 26,1 27,1 28,16-  
33 29,1 30,7-16 31,3 32,2 33,7-15 34,1 35,1 36,1  
37,1-2 38,1 39,1 40,1 41,1 42,1 43,0.5-1.5 44,1  
45,1 46,1 47,3 48,3 49,1 50,0
- # \bi{}Eragrostis cilianensis \i0{}(All.) Janch.\  
b0{}/  
1,1 2,2 3,38-53 4,1 5,1 6,1 7,1 8,1 9,2 10,5-  
6 11,1-2 12,1 13,5 14,1 15,2 16,2 17,1 18,1 19,1  
20,2 21,1 22,2 23,2 24,1 25,2 26,1 27,1 28,16-  
27 29,1 30,8-16 31,3 32,2 33,7-9 34,1 35,1 36,3



37,1-2 38,1 39,1 40,1 41,1 42,3 43,0.5-1 44,1 45,1 46,3 47,3 48,3 49,1 50,0

# *Eragrostis lepida* (A.Rich.) Hochst. ex Steud.

1,1 2,1 3,7-9 4,1 5,1 6,1 7,2 8,1 9,1 10,7-9 11,2-4 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1 20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,2 28,15-24 29,1 30,2-11 31,2 32,2 33,1-2 34,1 35,3 36,2 37,1-1.5 38,1 39,1 40,1 41,2 42,2 43,0.5-1 44,1 45,1 46,3 47,2 48,1 49,1 50,0

# *Eragrostis papposa* (Desf. ex Roem. & Schult.) Steud.

1,2 2,1 3,46-66 4,1 5,1 6,1 7,1 8,1 9,2 10,7-19 11,2-3 12,1 13,5 14,1 15,2 16,2 17,1 18,1 19,1 20,2 21,1 22,2 23,3 24,1 25,3 26,1 27,1 28,12-22 29,1 30,3-7 31,3 32,2 33,5-12 34,1 35,1 36,1 37,1.5-2 38,1 39,1 40,1 41,1 42,1 43,0.5-1.5 44,1 45,1 46,3 47,2 48,1 49,1 50,0

# *Eragrostis pilosa* (L.) Beauv.

1,1 2,1 3,49-55 4,1 5,1 6,1 7,1 8,1 9,2 10,10-22 11,1.5-2 12,3 13,5 14,1 15,2 16,2 17,1 18,1 19,1 20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,3 28,18-28 29,1 30,6-15 31,2 32,2 33,7-9 34,1 35,1 36,2 37,0.5-1 38,1 39,2 40,1 41,1 42,2 43,0.2-0.5 44,1 45,2 46,1 47,1 48,1 49,1 50,0

# *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.

1,2 2,2 3,63-82 4,1 5,1 6,1 7,2 8,1 9,1 10,9-23 11,2-4 12,1 13,5 14,1 15,2 16,2 17,1 18,1 19,1 20,2 21,2 22,1 23,2 24,1 25,1 26,1 27,2 28,15-19 29,1 30,7-9 31,2 32,3 33,9-11 34,1 35,1 36,2 37,9-11 38,1 39,3 40,1 41,1 42,1 43,8-10 44,1 45,3 46,1 47,2 48,1 49,1 50,5-8

# *Hyparrhenia hirta* (L.) Stapf

1,2 2,4 3,65-95 4,1 5,1 6,1 7,2 8,1 9,3 10,7-25 11,1-3 12,3 13,5 14,2 15,1 16,2 17,1 18,1 19,1 20,1 21,2 22,1 23,2 24,1 25,1 26,1 27,2 28,12-18 29,1 30,3-4 31,2 32,3 33,5-6 34,1 35,2 36,3 37,5-6 38,1 39,3 40,1 41,3 42,3 43,5-6 44,1 45,3 46,1 47,3 48,1 49,1 50,19-27

# *Lasiurus scindicus* (L.) Henrard

1,2 2,2 3,44-104 4,1 5,1 6,1 7,2 8,1 9,3 10,8-15 11,1-3 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1 20,2 21,2 22,1 23,3 24,1 25,1 26,1 27,1 28,8-12 29,1 30,2-6 31,2 32,3 33,6-8 34,1 35,2 36,1 37,4-5 38,1 39,3 40,1 41,3 42,1 43,5-6 44,1 45,3 46,1 47,2 48,1 49,1 50,0

# *Leptotrichum senegalense* (Kunth) Clayton

1,2 2,2 3,15-29 4,1 5,1 6,1 7,2 8,1 9,3 10,1-3 11,1-1.5 12,2 13,5 14,1 15,2 16,1 17,2 18,1 19,1 20,2 21,2 22,2 23,2 24,1 25,1 26,1 27,3 28,10-15 29,1 30,3-7 31,2 32,2 33,4-5 34,1 35,4 36,3 37,2.5-3 38,1 39,2 40,1 41,4 42,3 43,3-4 44,1 45,2 46,1 47,3 48,3 49,1 50,0

# *Melinis repens* (Willd.) Zizka

1,2 2,1 3,35-49 4,1 5,1 6,1 7,3 8,1 9,2 10,3-7 11,1.5-2 12,1 13,5 14,2 15,2 16,2 17,2 18,1 19,1 20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,1 28,7-12 29,1 30,2-3 31,1 32,2 33,2-2.5 34,4 35,2 36,1 37,1.5-2 38,1 39,3 40,3 41,3 42,1 43,0.5-1.5 44,1 45,3 46,3 47,2 48,2 49,1 50,0

# *Ochthochloa compressa* (Forssk.) Hilu

1,2 2,2 3,38-60 4,1 5,1 6,1 7,2 8,1 9,2 10,3-7 11,2-3 12,1 13,5 14,1 15,2 16,2 17,1 18,1 19,2 20,1 21,2 22,1 23,3 24,1 25,3 26,3 27,1 28,6-13 29,1 30,3-11 31,2 32,2 33,5-6 34,1 35,1 36,1 37,4-5 38,1 39,1 40,2 41,1 42,1 43,3-4 44,1 45,1 46,3 47,2 48,2 49,2 50,0

# *Odyssa mucronata* (Forssk.) Stapf

1,2 2,2 3,30-57 4,1 5,1 6,1 7,3 8,1 9,3 10,1.5-4 11,1-2 12,2 13,5 14,1 15,2 16,1 17,2 18,1 19,3 20,1 21,2 22,2 23,3 24,4 25,1 26,2 27,1 28,2-2.5 29,1 30,0.5-1 31,2 32,2 33,7-9 34,1 35,1 36,2 37,3-4 38,1 39,1 40,1 41,1 42,2 43,2-3 44,1 45,1 46,2 47,1 48,2 49,2 50,0

# *Panicum antidotale* (Retz.) L.

1,2 2,2 3,58-82 4,1 5,1 6,1 7,2 8,1 9,1 10,13-26 11,5-10 12,1 13,3 14,2 15,1 16,2 17,1 18,1 19,1 20,2 21,1 22,1 23,2 24,1 25,2 26,1 27,3 28,12-23 29,1 30,5-15 31,1 32,2 33,2-3 34,3 35,1 36,2 37,2-3 38,1 39,1 40,1 41,1 42,2 43,1-2 44,2 45,1 46,3 47,1 48,1 49,1 50,0

# *Panicum coloratum* L.

1,2 2,2 3,84-105 4,1 5,1 6,1 7,2 8,1 9,1 10,18-33 11,3-7 12,1 13,3 14,1 15,2 16,2 17,1 18,1 19,1 20,2 21,1 22,1 23,2 24,1 25,2 26,1 27,1 28,25-42 29,1 30,16-22 31,1 32,2 33,4-5 34,1 35,4 36,1 37,4-5 38,2 39,3 40,1 41,4 42,1 43,3-4 44,1 45,3 46,1 47,2 48,1 49,1 50,0

# *Panicum maximum* (Jacq.) L.

1,2 2,2 3,86-142 4,1 5,1 6,1 7,2 8,1 9,1 10,18-35

11,5-11 12,1 13,3 14,2 15,1 16,2 17,1 18,1 19,1  
20,2 21,1 22,1 23,3 24,1 25,3 26,1 27,3 28,20-48  
29,1 30,6-16 31,1 32,2 33,2.5-3 34,1 35,1 36,3  
37,2-2.5 38,1 39,1 40,1 41,1 42,3 43,1-1.5 44,2  
45,1 46,3 47,2 48,1 49,1 50,0

# *Panicum turgidum* (Forssk.)

1,2 2,2 3,62-110 4,1 5,1 6,1 7,2 8,1 9,1 10,3-7  
11,3-8 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,1 23,1 24,1 25,3 26,1 27,1 28,9-16  
29,1 30,3-9 31,1 32,2 33,2.5-3.5 34,1 35,1 36,2  
37,2.5-3 38,1 39,1 40,1 41,1 42,2 43,2.5-3 44,1  
45,1 46,1 47,2 48,1 49,1 50,0

# *Paspalidium desertorum* (A. Rich.) Stapf

1,2 2,2 3,23-35 4,3 5,1 6,1 7,1 8,1 9,1 10,5-16  
11,3-5 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,1 22,2 23,3 24,2 25,1 26,1 27,3 28,8-20  
29,1 30,2.5-8 31,1 32,2 33,2.5-3 34,1 35,1 36,2  
37,1.5-2 38,1 39,1 40,1 41,1 42,2 43,1-1.5 44,2  
45,1 46,2 47,2 48,1 49,1 50,0

# *Pennisetum setaceum* (Forssk.) Chiov.

1,2 2,2 3,90-115 4,1 5,1 6,1 7,2 8,1 9,2 10,16-46  
11,2-4 12,1 13,3 14,2 15,1 16,2 17,1 18,1 19,1  
20,2 21,2 22,2 23,3 24,1 25,1 26,1 27,1 28,26-  
30 29,1 30,10-14 31,1 32,2 33,4-5 34,1 35,1 36,1  
37,4.5-5 38,1 39,1 40,1 41,1 42,1 43,1.5-2.5 44,1  
45,1 46,1 47,2 48,1 49,1 50,0

# *Schoenfeldia gracilis* (Kunth)

1,1 2,2 3,44-76 4,1 5,1 6,1 7,1 8,1 9,2 10,14-27  
11,1.5-3 12,3 13,3 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,2 23,2 24,1 25,2 26,3 27,3 28,13-  
30 29,1 30,7-16 31,1 32,2 33,4-5 34,1 35,1 36,1  
37,2.5-3 38,1 39,2 40,1 41,1 42,1 43,2-2.5 44,1  
45,2 46,1 47,2 48,2 49,1 50,20-27

# *Setaria megaphylla* (Steud.) T. Durand & Schinz

1,2 2,2 3,100-130 4,1 5,1 6,1 7,2 8,2 9,1 10,38-58  
11,15-20 12,1 13,3 14,2 15,1 16,2 17,1 18,1 19,2  
20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,3 28,39-  
50 29,3 30,4-6 31,1 32,2 33,2.5-3 34,1 35,1 36,3  
37,1.5-2.5 38,2 39,1 40,1 41,1 42,3 43,1-1.5 44,1  
45,1 46,1 47,3 48,1 49,1 50,0

# *Setaria verticillata* (L.) P. Beauv.

1,2 2,3 3,48-60 4,1 5,1 6,1 7,1 8,1 9,1 10,15-18  
11,5-7 12,3 13,3 14,2 15,2 16,1 17,2 18,1 19,2

20,2 21,2 22,2 23,3 24,1 25,2 26,1 27,3 28,8-11  
29,3 30,2-4 31,2 32,2 33,1.5-2.5 34,1 35,3 36,1  
37,1-2 38,1 39,1 40,1 41,2 42,1 43,0.5-1 44,2 45,1  
46,1 47,2 48,1 49,1 50,0

# *Sporobolus helvolus* (Trin.) T. Durand & Schinz

1,2 2,2 3,35-58 4,1 5,1 6,1 7,2 8,1 9,1 10,2-7  
11,1.5-2 12,2 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,1 28,11-  
17 29,1 30,2-5 31,1 32,2 33,1-1.5 34,1 35,1 36,1  
37,1-1.5 38,1 39,1 40,1 41,1 42,1 43,1-1.5 44,1  
45,1 46,1 47,2 48,1 49,1 50,0

# *Sporobolus minutus* (Link)

1,1 2,1 3,25-37 4,1 5,1 6,1 7,3 8,1 9,2 10,3-5  
11,0.5-1.5 12,1 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,2 23,1 24,1 25,1 26,1 27,3 28,8-19  
29,1 30,3-13 31,1 32,2 33,1-1.5 34,1 35,1 36,1  
37,0.5-1 38,1 39,2 40,1 41,1 42,1 43,0.5-1 44,1  
45,2 46,3 47,2 48,1 49,1 50,0

# *Sporobolus pellucidus* (Hochst.)

1,2 2,2 3,77-100 4,1 5,1 6,1 7,2 8,1 9,1 10,37-56  
11,3-5 12,3 13,3 14,2 15,1 16,2 17,1 18,1 19,2  
20,2 21,2 22,1 23,2 24,1 25,3 26,1 27,3 28,46-55  
29,1 30,10-12 31,1 32,2 33,2-2.5 34,1 35,1 36,1  
37,2-2.5 38,1 39,1 40,1 41,1 42,1 43,1.5-2 44,1  
45,1 46,1 47,2 48,1 49,1 50,0

# *Sporobolus pyramidalis* (P. Beauv.)

1,2 2,2 3,43-68 4,1 5,1 6,1 7,2 8,1 9,2 10,8-12  
11,1.5-2 12,1 13,1 14,1 15,2 16,2 17,1 18,1 19,1  
20,2 21,2 22,2 23,2 24,1 25,3 26,1 27,3 28,23-  
30 29,1 30,5-8 31,1 32,2 33,2-2.5 34,2 35,1 36,2  
37,1.5-2 38,3 39,1 40,3 41,1 42,2 43,1.5-2  
44,2 45,1 46,2 47,1 48,1 49,1 50,0

# *Sporobolus spicatus* (Vahl) Kunth

1,2 2,2 3,21-30 4,3 5,1 6,1 7,2 8,1 9,2 10,2-5  
11,1.5-2 12,2 13,5 14,1 15,2 16,1 17,2 18,1 19,1  
20,2 21,2 22,2 23,3 24,1 25,1 26,1 27,1 28,5.5-10  
29,3 30,1.5-3 31,1 32,2 33,1.5-2 34,1 35,1 36,1  
37,1.5-2 38,1 39,1 40,1 41,1 42,1 43,1-1.5 44,1  
45,1 46,1 47,2 48,1 49,1 50,0

# *Stipagrostis hirtigluma* (Steud. ex Trin. & Rupr.) De Winter

1,1 2,2 3,53-62 4,1 5,1 6,1 7,1 8,1 9,2 10,6-13  
11,1-2 12,3 13,2 14,2 15,1 16,2 17,1 18,1 19,1  
20,1 21,1 22,2 23,3 24,1 25,2 26,1 27,1 28,22-30  
29,1 30,4-11 31,1 32,2 33,10-14 34,1 35,2 36,1

37,10-13 38,1 39,3 40,1 41,3 42,1 43,7.5-9 44,1  
45,1 46,1 47,3 48,3 49,1 50,50-60

# *Stipagrostis multinerva* (H. Scholz)  
b0{/

1,2 2,1 3,77-89 4,1 5,1 6,1 7,2 8,1 9,2 10,8-11  
11,1-2 12,3 13,2 14,2 15,1 16,2 17,1 18,1 19,1  
20,1 21,1 22,2 23,3 24,1 25,2 26,1 27,1 28,17-  
28 29,1 30,6-11 31,1 32,2 33,9-15 34,1 35,1 36,1  
37,8-10 38,1 39,1 40,1 41,4 42,1 43,7-8 44,1 45,2  
46,1 47,3 48,3 49,1 50,29-40

# *Stipagrostis plumosa* (Munro ex T.  
Anderson) b0{/

1,2 2,2 3,69-74 4,1 5,1 6,1 7,1 8,1 9,2 10,8-12  
11,1.5-2 12,3 13,2 14,2 15,1 16,2 17,1 18,1 19,3  
20,1 21,1 22,2 23,3 24,1 25,2 26,1 27,1 28,23-  
28 29,1 30,5-9 31,1 32,2 33,7-10 34,1 35,1 36,1  
37,8-9 38,1 39,1 40,1 41,1 42,1 43,6-7.5 44,1 45,1  
46,1 47,3 48,3 49,1 50,36-46

# *Stipagrostis uniplumis* (Licht.) De  
Winter b0{/

1,2 2,1 3,58-66 4,1 5,1 6,1 7,1 8,1 9,2 10,7-10  
11,1-2 12,3 13,2 14,2 15,1 16,2 17,1 18,1 19,1  
20,1 21,1 22,2 23,3 24,1 25,2 26,1 27,1 28,20-  
26 29,1 30,5-11 31,1 32,2 33,7-11 34,1 35,1 36,1  
37,8-9 38,1 39,1 40,1 41,1 42,1 43,6-7.5 44,1 45,1

46,1 47,3 48,3 49,1 50,39-44

# *Tetrapogon cenchriformis* (A. Rich.)  
Clayton b0{/

1,1 2,2 3,30-56 4,1 5,1 6,1 7,1 8,1 9,2 10,2-4 11,2-  
3 12,1 13,5 14,1 15,2 16,2 17,1 18,1 19,1 20,2  
21,2 22,2 23,3 24,1 25,1 26,1 27,1 28,5-10 29,1  
30,2-5 31,2 32,2 33,6-9 34,1 35,1 36,1 37,7-9  
38,1 39,1 40,1 41,1 42,1 43,5.5-7 44,1 45,1 46,1  
47,2 48,2 49,2 50,6-9

# *Themeda triandra* (Forssk.) b0{/

1,1 2,3 3,84-100 4,1 5,1 6,1 7,2 8,2 9,1 10,10-18  
11,2-3 12,1 13,1 14,2 15,1 16,2 17,1 18,1 19,1  
20,2 21,2 22,2 23,2 24,1 25,3 26,1 27,2 28,15-  
40 29,1 30,5-7 31,2 32,3 33,7-10 34,1 35,1 36,1  
37,7-10 38,1 39,1 40,1 41,1 42,1 43,6-7 44,1 45,1  
46,1 47,2 48,1 49,1 50,4.5-8

# *Tricholaena teneriffae* (L. f.)  
Link b0{/

1,2 2,1 3,43-76 4,1 5,2 6,1 7,2 8,1 9,1 10,8.5-12  
11,2-4 12,1 13,4 14,2 15,2 16,2 17,2 18,2 19,1  
20,2 21,2 22,2 23,3 24,1 25,3 26,1 27,3 28,12-21  
29,2 30,2-8 31,2 32,2 33,5-6 34,4 35,2 36,1 37,5-  
6 38,1 39,3 40,3 41,4 42,1 43,4-5 44,1 45,3 46,1  
47,2 48,2 49,1 50,0

*The computer-generated conventional key*

*Characters:* 50 in data, 41 included, 22 in key.

*Items:* 55 in data, 55 included, 55 in key.

*Parameters:* Rbase = 1.40 Abase = 2.00 Reuse = 1.01 Varywt = .80

*Characters included:* 1-2 4-9 12-27 29 31-32 34-36 38-42 44-49

*Character reliabilities:* 1-50,5.0

- |   |  |
|---|--|
| 1. Inflorescence simple spike.....  | 2  |
| Inflorescence dense spike-like panicle.....                                       | 11   |
| Inflorescence open spike-like panicle.....  | 23   |
| 2(1).Upper glume glabrous.....  | 3  |
| Upper glume villous.....  | 8  |
| Upper glume membranous.....   | 9  |
| Upper glume spinulose.....  | <i>Leptotrichum senegalense</i> (Kunth) Clayton    |
| 3(2).Node black.....  | 4  |
| Node light brown.....   | 5  |
| Node not coloured.....  | 7  |
| 4(3).Lemma linear; upper glume cream-coloured; lower glume<br>cream-coloured..... | <i>Tetrapogon cenchriformis</i> (A. Rich.) Clayton |
| Lemma elliptic; upper glume green; lower glume green.....                         | <i>Paspalidium desertorum</i> (A. Rich.) Stapf     |
| Lemma ovate; upper glume brown; lower glume brown.....                            | <i>Cenchrus biflorus</i> Roxb.                     |



- 5(3). Leaf blade margin with hispid papillae; leaf blade upper surface hairy; leaf blade upper surface scarious..... *Pennisetum setaceum* (Forssk.) Chiov.  
 Leaf blade margin smooth; leaf blade upper surface glabrous; leaf blade upper surface rigid..... 6
- 6(5). Leaf blade flat; leaf blade apex acute-acuminate; sheath colour darker than culm; inflorescence brown ..  
 ..... *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.  
 Leaf blade folded; leaf blade apex pungent; sheath colour same as culm; inflorescence yellow .....  
 ..... *Sporobolus spicatus* (Vahl) Kunth
- 7(3). Leaf blade flat; sheath colour darker than culm..... *Dichanthium foveolatum* (Delile) Roberty  
 Leaf blade folded; sheath colour lighter than culm..... *Sporobolus minutus* Link  
 Leaf blade rolled; sheath colour same as culm..... *Odyssa mucronata* (Forssk.) Stapf
- 8(2). Plant yellow..... *Bothriochloa radicans* (Lehm.) A. Camus  
 Plant green..... *Lasiurus scindicus* Henrard  
 Plant reddish brown..... *Hyparrhenia hirta* (L.) Stapf
- 9(2). Sheath glabrous..... *Cenchrus echinatus* L.  
 Sheath hairy..... 10  
 Sheath coriaceous..... *Cenchrus ciliaris* L.
- 10(9). Upper glume cream-coloured; lower glume cream-coloured..... *Cenchrus setigerus* Vahl  
 Upper glume green; lower glume green..... *Cenchrus pennisetiformis* Steud.  
 Upper glume brown; lower glume brown..... *Brachiaria leersioides* (Hochst.) Stapf
- 11(1). Lemma cream-coloured..... 12  
 Lemma green..... 15  
 Lemma brown..... 19
- 12(11). Inflorescence yellow..... 13  
 Inflorescence brown..... 14  
 Inflorescence green..... *Panicum antidotale* Retz.
- 13(12). Node black; leaf blade flat; leaf blade upper surface hairy; leaf blade upper surface scarious .....  
 ..... *Chloris virgata* Sw.  
 Node not coloured; leaf blade rolled; leaf blade upper surface glabrous; leaf blade upper surface rigid .....  
 ..... *Aeluropus lagopoides* (L.) Thwaites
- 14(12). Leaf blade flat; leaf blade upper surface hairy; leaf blade upper surface scarious; sheath colour darker than culm .....  
 ..... *Enneapogon desvauxii* P. Beauv.  
 Leaf blade folded; leaf blade upper surface glabrous; leaf blade upper surface rigid; sheath colour same as culm.....  
 ..... *Enneapogon persicus* Boiss.
- 15(11). Lemma linea..... 16  
 Lemma elliptic..... *Chloris barbata* Sw.  
 Lemma ovate ..... 18
- 16(15). Upper glume glabrous; lower glume glabrous..... 17  
 Upper glume membranous; lower glume membranous..... *Setaria verticillata* (L.) P. Beauv.  
 Upper glume spinulose; lower glume spinulose..... *Panicum coloratum* L.
- 17(16). Leaf blade flat; leaf blade apex acute-acuminate; sheath veins prominent; sheath colour same as culm..  
 ..... *Dactyloctenium scindicum* Boiss.  
 Leaf blade folded; leaf blade apex filiform; sheath veins not prominent; sheath colour darker than culm...

- .....*Schoenfeldia gracilis* Kunth
- 18(15).Node black; leaf blade margin with hispid papillae; leaf blade upper surface rigid; sheath colour darker than culm..... *Dactyloctenium aristatum* Link  
Node light brown; leaf blade margin smooth; leaf blade upper surface scarios; sheath colour same as culm ..... *Dactyloctenium aegyptium* (L.) Willd.
- 19(11).Lower glume glabrous..... 20  
Lower glume hairy..... *Stipagrostis hirtigluma* (Steud. ex Trin. & Rupr.) De Winter  
Lower glume spinulose..... *Stipagrostis multinerva* H. Scholz
- 20(19).Leaf blade margin spiny; leaf blade upper surface hairy; leaf blade upper surface scarios; sheath colour same as culm..... 21  
Leaf blade margin smooth; leaf blade upper surface glabrous; leaf blade upper surface rigid; sheath colour darker than culm..... 22
- 21(20).Sheath shorter than internode; plant yellow..... *Stipagrostis uniplumis* (Licht.) De Winter  
Sheath longer than internode; plant green..... *Stipagrostis plumosa* Munro ex T. Anderson
- 22(20).Leaf blade flat; upper glume cream-coloured; lower glume cream-coloured; lemma linear .....  
..... *Eragrostis barrelieri* Daveau  
Leaf blade folded; upper glume brown; lower glume brown; lemma ovate .....  
..... *Eragrostis cilianensis* (All.) Janch.
- 23(1).Leaf blade margin with hooked appendages..... 24  
Leaf blade margin with hispid papillae..... 25  
Leaf blade margin hairy..... *Tricholaena teneriffae* (L. f.) Link  
Leaf blade margin smooth..... 27
- 24(23).Inflorescence yellow; spikelets sessile..... *Digitaria ciliaris* (Retz.) Koeler  
Inflorescence brown; spikelets sessile and pedicelled..... *Themeda triandra* Forssk.  
Inflorescence green; spikelets pedicelled..... *Sporobolus pyramidalis* P. Beauv.
- 25(23).Lemma linear; sheath equal to internode; sheath veins not prominent; lower glume tip acute-acuminate....26  
Lemma ovate; sheath shorter than internode; sheath veins prominent; lower glume tip obtuse .....  
..... *Panicum maximum* Jacq.
- 26(25).Leaf blade apex acute-acuminate; sheath colour same as culm; upper glume brown; lower glume brown ..... *Setaria megaphylla* (Steud.) T. Durand & Schinz  
Leaf blade apex filiform; sheath colour darker than culm; upper glume cream-coloured; lower glume cream-coloured..... *Sporobolus pellucidus* Hochst.
- 27(23).Lemma linear..... 28  
Lemma elliptic..... 31  
Lemma ovate..... 32
- 28(27).Node black..... 29  
Node light brown..... 30  
Node not coloured..... *Eleusine indica* (L.) Gaertn.
- 29(28).Inflorescence yellow; number of florets per spike 1; upper glume cream-coloured; lower glume cream-coloured..... *Aristida adscensionis* L.  
Inflorescence green; number of florets per spike 2-9; upper glume green; lower glume green .....  
..... *Eragrostis pilosa* (L.) Beauv.

- 30(28). Sheath colour lighter than culm; upper glume green; lower glume green; leaf blade apex acute-acuminate ..... *Panicum turgidum* Forssk.  
 Sheath colour same as culm; upper glume cream-coloured; lower glume cream-coloured; leaf blade apex pungent..... *Sporobolus helvolus* (Trin.) T. Durand & Schinz
- 31(27). Node black; leaf blade folded; plant green; sheath colour same as culm.....  
 ..... *Aristida mutabilis* Trin. & Rupr.  
 Node light brown; leaf blade flat; plant brown; sheath colour darker than culm.....  
 ..... *Echinochloa colona* (L.) Link
- 32(27). Number of florets per spike 1..... 33  
 Number of florets per spike 2-9..... 34  
 Number of florets per spike 10 or more..... *Eragrostis papposa* (Desf. ex Roem. & Schult.) Steud.
- 33(32). Node light brown; leaf blade flat; plant green; leaf blade upper surface glabrous. *Cynodon dactylon* L.  
 Node not coloured; leaf blade folded; plant yellow; leaf blade upper surface hairy .....  
 ..... *Melinis repens* (Willd.) Zizka
- 34(32). Leaf blade flat; plant yellow; sheath shorter than internode; inflorescence brown .....  
 ..... *Eragrostis lepida* (A.Rich.) Hochst. ex Steud.  
 Leaf blade folded; plant green; sheath equal to internode; inflorescence yellow .....  
 ..... *Ochthochloa compressa* (Forssk.) Hilu

#### Descriptions

##### *Aeluropus lagopoides* (L.) Thwaites

Plant perennial, green, height 7–13cm. Culm creeping, glabrous, cylindrical. Node not coloured. Leaf blade lanceolate, rolled, length 1.5–3.5cm, width 1–1.5cm, apex pungent, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, longer than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule hairy. Inflorescence dense spike-like panicle, globose, yellow, length 1.5–3.5cm. Peduncle glabrous, length 1–2cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2.5–3mm. Upper glume ovate, glabrous, green, length 2–2.5mm, tip acute-acuminate, margin villous. Lower glume lanceolate, glabrous, green, length 1.5–2mm, tip acute-acuminate, margin hairy. Lemma ovate, cream-coloured, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (7.3.2020, salt marshes, 16°59'42.0"N, 42°33'37"E).

##### *Aristida adscensionis* L.

Plant annual, yellow, height 65–77cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 25–44cm, width 1–2.5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower

surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 27–46cm. Peduncle glabrous, length 8–11 cm. Number of florets per spike 1. Spikelets pedicelled, length 6–8mm. Upper glume linear, glabrous, cream-coloured, length 5–6.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 3.5–6mm, tip acute-acuminate, margin entire. Lemma linear, green, scabrid, shorter than glumes. Awn length 15–19mm.

*Collection data:* (2.3.20, mountainous, 17°15'05.8"N, 43°05'24.1"E).

##### *Aristida mutabilis* Trin. & Rupr.

Plant annual, green, height 35–40cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 5–9 cm, width 1–1.5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 14–20cm. Peduncle glabrous, length 6–12 cm. Number of florets per spike 1. Spikelets pedicelled, length

5–7mm. Upper glume linear, glabrous, cream-coloured, length 4–6mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 2.5–3.5mm, tip acute-acuminate, margin entire. Lemma elliptic, brown, glabrous, shorter than glumes. Awn length 16–24mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (25.1.2019, sand-loam, 17°16'07.9"N, 42°42'46.2"E); (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E); (15.2.2019; sand dune; 17°01'08.4"N, 42°43'27.6"E); (16.2.2019, gravels, 17°35'39.4"N, 42°18'36.2"E); (16.2.2019, gravels, 17°41'25.7"N, 42°11'46.7"E); (1.3.2019, salt marshes, 16°53'08.5"N, 42°24'39.0"E).

*Bothriochloa radicans* (Lehm.) A. Camus

Plant perennial, yellow, height 85–105cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 15–26cm, width 2–4cm, apex acute-acuminate, margin with hooked appendages. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath hairy, shorter than internode, surrounding internode completely, veins not prominent, tip not auriculate, colour same as culm. Ligule glabrous. Inflorescence simple spike, elongate, yellow, length 6–8cm. Peduncle glabrous, length 4–7cm. Number of florets per spike 1. Spikelets pedicelled, length 2–3.5mm. Upper glume linear, villous, cream-coloured, length 4–5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 3.5–5mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 20–26mm.

*Collection data:* (2.3.2019, sandy, 17°15'05.8"N, 43°05'24.1"E).

*Brachiaria leersioides* (Hochst.) Stapf

Plant annual, brown, height 30–38cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 9–12cm, width 3–7cm, apex acute-acuminate, margin spiny. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath hairy, shorter than internode, surrounding internode completely, veins prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 12–18cm. Peduncle glabrous, length 3–8cm. Number of

florets per spike 1. Spikelets pedicelled, length 3–4mm. Upper glume ovate, membranous, brown, length 2–3mm, tip acute-acuminate, margin entire. Lower glume ovate, glabrous, brown, length 0.5–1mm, tip acute-acuminate, margin entire. Lemma ovate, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sandy, 16°42'10.16"N, 42°36'18.55"E), (2.3.2019, mountainous, 17°15'05.8"N 43°05'24.1"E).

*Cenchrus biflorus* Roxb.

Plant annual, green, height 18–20cm. Culm erect, glabrous, angled. Node black. Leaf blade linear, folded, length 3–4cm, width 2–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scariosus. Leaf blade lower surface hairy, scariosus. Sheath coriaceous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 6–8 cm. Peduncle scariosus, length 2–3.5cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2.5–5mm. Upper glume ovate, glabrous, brown, length 2–3mm, tip acute-acuminate, margin entire. Lower glume ovate, glabrous, brown, length 1–2.5mm, tip acute-acuminate, margin entire. Lemma ovate, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E).

*Cenchrus ciliaris* L.

Plant perennial, green, height 72–95cm. Culm erect, glabrous, angled. Node black. Leaf blade linear, flat, length 6–22cm, width 2–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scariosus. Leaf blade lower surface hairy, scariosus. Sheath coriaceous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 10–18cm. Peduncle scariosus, length 3–10.5cm. Number of florets per spike 2–9. Spikelets pedicelled, length 3–5mm. Upper glume linear, membranous, cream-coloured, length 2–3.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, membranous, cream-coloured, length 1–2mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (18.1.2019, sandy, 16°08'58.27"N, 42°07'39.18"E); (19.1.2019, sandy, 16°56'02.0"N, 42°35'04.1"E); (19.1.2019, sand-loam, 16°10'16.42"N, 42°36'18.55"E); (25.1.2019, sand-loam, 17°16'07.9"N, 42°42'46.2"E); (25.1.2019, gravels, 17°19'34.5"N, 42°45'48.9"E); (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E); (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E); (15.2.2019, sand dune, 17°01'08.4"N, 42°43'27.6"E); (16.2.2019, sandy, 17°28'47.18"N, 42°31'06.53"E); (16.2.2019, gravels, 17°44'23.4"N, 41°59'32.8"E); (16.2.2019, gravels, 17°41'25.7"N, 42°11'46.7"E); (16.2.2019, gravels, 17°28'47.38"N, 42°38'30.02"E); (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E); (26.2.2019, sand-loam, 16°57'40.4"N, 42°33'14.0"E); (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E); (8.3.2019, sand-loam, 16°47'25.14"N, 42°33'40.29"E).

*Cenchrus echinatus* L.

Plant annual, green, height 90–115cm. Culm erect, glabrous, angled. Node black. Leaf blade linear, flat, length 4–12cm, width 2–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, rigid. Leaf blade lower surface hairy, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 7–20cm. Peduncle glabrous, length 3.5–9cm. Number of florets per spike 2–9. Spikelets pedicelled, length 5–7mm. Upper glume linear, membranous, cream-coloured, length 3–4mm, tip acute-acuminate, margin entire. Lower glume lanceolate, membranous, cream-coloured, length 1.5–2mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (19.1.2019, sandy, 16°56'02.0"N, 42°35'04.1"E); (25.1.2019, gravels, 17°19'34.5"N, 42°45'48.9"E); (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E); (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E); (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E); (15.2.2019,

clay, 17°05'47.2"N, 42°46'55.1"E); (16.2.2019, gravels, 17°28'47.18"N, 42°38'30.02"E); (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E); (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Cenchrus pennisetiformis* Steud.

Plant annual, green, height 31–68cm. Culm erect, glabrous, angled. Node black. Leaf blade linear, flat, length 3–10cm, width 2–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath hairy, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 12–19cm. Peduncle scarios, length 5–13cm. Number of florets per spike 2–9. Spikelets pedicelled, length 3–5mm. Upper glume linear, membranous, green, length 3–4.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, membranous, green, length 2–3mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (18.1.2019, sandy, 16°08'58.27"N, 24°07'39.18"E); (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E); (16.2.2019, sandy, 17°28'47.18"N, 42°31'06.53"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E).

*Cenchrus setigerus* Vahl

Plant perennial, green, height 46–85cm. Culm erect, glabrous, angled. Node black. Leaf blade linear, flat, length 5–10cm, width 1–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath hairy, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 7–13cm. Peduncle scarios, length 3.5–6cm. Number of florets per spike 2–9. Spikelets pedicelled, length 3.5–5mm. Upper glume linear, membranous, cream-coloured, length 3–4mm, tip acute-acuminate, margin entire. Lower glume lanceolate, membranous, cream-coloured, length 1.5–2mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.



*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (18.1.2019, sandy, 16° 08'58.27"N, 24°07'39.18"E); (19.1.2019, sandy, 16°56'02.0"N, 42°35'04.1"E); (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E); (15.2.2019, clay, 17°05'47.2"N, 42°46'55.1"E); (16.2.2019; sandy, 17°28'47.18"N, 42° 31' 06.53"E); (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E).

*Chloris barbata* Sw.

Plant perennial, green, height 70–89cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 4–12cm, width 2–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scariosus. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule hairy. Inflorescence dense spike-like panicle, elongate, yellow, length 8–26cm. Peduncle glabrous, length 13–20cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2.5–3mm. Upper glume linear, glabrous, cream-coloured, length 1.5–2 mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 0.5–1mm, tip acute-acuminate, margin entire. Lemma elliptic, green, glabrous, longer than glumes. Awn length 5–8mm.

*Collection data:* (19.1.2019, sand-loam, 16°10'16.42"N, 42°36'18.55"E); (19.1.2019, sandy, 16°56' 02.0 N, 42°35' 04.1 E); (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E); (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E); (15.2.2019, clay, 17°05'47.2"N, 42°46' 55.1"E); (16.2.2019, gravels, 17°23'17.56"N, 42°41'41.34"E); (22.2.2019, sandy, 16°42' 35.2"N, 41°58'55.7"E); (26.2.2019, sand-loam, 16°57'40.4"N, 42°33'14.0"E); (8.3.2019, sand-loam, 16°47'25.14"N, 42°33'40.29"E).

*Chloris virgata* Sw.

Plant annual, green, height 70–96cm. Culm erect, glabrous, angled. Node black. Leaf blade linear, flat, length 24–35cm, width 4–5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scariosus. Leaf blade lower surface hairy, scariosus. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip auriculate, colour same

as culm. Ligule hairy. Inflorescence dense spike-like panicle, elongate, yellow, length 14–30cm. Peduncle glabrous, length 8–22cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2–3mm. Upper glume linear, glabrous, cream-coloured, length 2.5–4mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1–2mm, tip acute-acuminate, margin entire. Lemma ovate, cream-coloured, glabrous, longer than glumes. Awn length 3.5–4mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E); (16.2.2019, gravels, 17° 28'47.38"N, 42°38'30.02"E); (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Cynodon dactylon* L.

Plant perennial, green, height 34–60cm. Culm runner, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 3–8cm, width 1–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 6–8cm. Peduncle glabrous length 1–3cm. Number of florets per spike 1. Spikelets pedicelled, length 1.5–2.5mm. Upper glume linear, glabrous, cream-coloured, length 1.5–2.5 mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1–1.5mm, tip acute-acuminate, entire. Lemma ovate, green, glabrous, longer than glumes. Awn length 0mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E); (22.2.2019, sandy, 16°42' 35.2"N, 41°58'55.7"E).

*Dactyloctenium aegyptium* (L.) Willd.

Plant annual, green, height 37–60cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 5–15cm, width 3–5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scariosus. Leaf blade lower surface hairy, scariosus. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 11–20cm. Peduncle



glabrous, length 8–17cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2.5–3mm. Upper glume elliptic, glabrous, cream-coloured, length 2–2.5mm, tip awned, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1–2mm, tip acute-acuminate, margin entire. Lemma ovate, green, glabrous, longer than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sand-loam, 1610.16<42°>N, 42°36'18.55»E); (19.1.2019, sandy, 16°56'02.0»N, 42°35'04.»E); (25.1.2019, sand-loam, 17°09'28.9»N, 42°41'35.0»E); (26.2.2019, sand-loam, 16°57'40.4»N, 42°33'14.0»E); (8.3.2019, sand-loam, 16°47'25.14»N, 42°33'40.29»E).

*Dactyloctenium aristatum* Link

Plant annual, green, height 41–53cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, length 8–13cm, width 1–3cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface hairy, rigid. Leaf blade lower surface hair, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 9–18cm. Peduncle glabrous, length 8–16cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2.5–3mm. Upper glume elliptic, glabrous, cream-coloured, length 2–2.5mm, tip awned, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1–2mm, tip acute-acuminate, margin entire. Lemma ovate, green, glabrous, longer than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sand-loam, 1610.16<42°>N, 42°36'18.55»E).

*Dactyloctenium scindicum* Boiss.

Plant perennial, green, height 31–55cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 1–4cm, width 1–2cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 9–18cm. Peduncle glabrous, length 7.5–16cm. Number of florets per spike 2–9. Spikelets pedicelled, length 2–3mm. Upper

glume elliptic, glabrous, cream-coloured, length 1.5–2 mm, tip awned, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 0.5–1mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, longer than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sandy, 16°56'02.0N, 42°35'04.1 E); (25.1.2019, sand-loam, 17°16'07.9' N, 42°42'46.2' E); (16.2.2019, gravels, 17°28'47.38"N, 42°38'30.02"E); (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E).

*Dichanthium foveolatum* (Delile) Roberty

Plant perennial, green, height 33–55cm. Culm erect, glabrous, cylindrical. Node not coloured. Leaf blade linear, flat, length 4–7cm, width 1–2cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath coriaceous, shorter than internode, surrounding internode completely, veins prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 8–14cm. Peduncle scarious, length 4.5–10cm. Number of florets per spike 2–9. Spikelets sessile and pedicelled, length 3.5–4mm. Upper glume oblong, glabrous, cream-coloured, length 3.5–4mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 3.5–4mm, tip acute-acuminate, margin entire. Lemma ovate, cream-coloured, glabrous, shorter than glumes. Awn length 12–16mm.

*Collection data:* (19.1.2019, sandy, 16°56'02.0"N, 42°35'04.1"E); (25.1.2019, gravels, 17°19'34.5"N, 42°45'48.9"E); (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E).

*Digitaria ciliaris* (Retz.) Koeler

Plant annual, green, height 30–60cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 3–7cm, width 2–5cm, apex acute-acuminate, margin with hooked appendages. Leaf blade upper surface hairy, scarious. Leaf blade lower surface hairy, scarious. Sheath glabrous. Sheath shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, digitate, yellow, length 16–25cm. Peduncle glabrous, length 7–17cm. Number of florets per spike 1. Spikelets sessile, length 0mm. Upper

glume linear, glabrous, cream-coloured, length 3.5–4mm, tip acute-acuminate, margin entire. Lower glume lanceolate, hairy, cream-coloured, length 2.5–3mm, tip acute-acuminate, margin hairy. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sand-loam, 16°10.16'42"N, 42°36'18.55"E); (25.1.2019, sand-loam, 17°09' 28.9' N, 42°41' 35.0' E).

*Echinochloa colona* (L.) Link

Plant annual, brown, height 26–58cm. Culm creeping, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 5–9cm, width 3–5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule absent. Inflorescence open spike-like panicle, elongate, brown, length 8.5–17cm. Peduncle glabrous, length 4–15cm. Number of florets per spike 1. Spikelets pedicelled, length 1.5–2.5mm. Upper glume elliptic, spinulose, green, length 2–2.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, spinulose, green, length 0.5–1mm, tip acute-acuminate, margin entire. Lemma elliptic, cream-coloured, scabrid, shorter than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sand-loam, 16°10.16'42"N, 42°36'18.55"E); (25.1.2019, sand-loam, 17°09' 28.9' N, 42°41' 35.0' E); (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E); (8.3.2019, sand-loam, 16°47'25.14"N, 42°33'40.29"E).

*Eleusine indica* (L.) Gaertn.

Plant annual, green, height 24–45cm. Culm erect, glabrous, cylindrical. Node not coloured. Leaf blade linear, folded, length 5–9cm, width 1.5–2cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, digitate, yellow, length 11–25cm. Peduncle glabrous, length 5–17 cm. Number of florets per spike 2–9. Spikelets pedicelled, length 6–9mm.

Upper glume linear, glabrous, cream-coloured, length 4.5–6mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 4–5mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E).

*Enneapogon desvauxii* P. Beauv.

Plant annual, green, height 35–40cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 2–4cm, width 1.5–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, brown, length 10–17cm. Peduncle glabrous, length 6–12cm. Number of florets per spike 2–9. Spikelets pedicelled, length 4.5–6mm. Upper glume linear, glabrous, green, length 5–6mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, green, length 4–5mm, tip acute-acuminate, margin entire. Lemma ovate, cream-coloured, hairy, longer than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37' N, 42°39'15.44"E).

*Enneapogon persicus* Boiss.

Plant annual, green, height 40–57cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, folded, length 4–13cm, width 1–2cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, brown, length 13–22cm. Peduncle glabrous, length 4–12cm. Number of florets per spike 2–9. Spikelets pedicelled, length 6.5–9mm. Upper glume linear, glabrous, green, length 6–9 mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, green, length 5–7mm, tip acute-acuminate, margin entire. Lemma ovate, cream-coloured, hairy, longer than glumes. Awn length 0mm.

*Collection data:* (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Eragrostis barrelieri* Daveau

Plant annual, green, height 38–53cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 4–12cm, width 1–2cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 16–33cm. Peduncle glabrous, length 7–16cm. Number of florets per spike 10 or more. Spikelets pedicelled, length 7–15mm. Upper glume linear, glabrous, cream-coloured, length 1–2mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 0.5–1.5mm, tip acute-acuminate, margin entire. Lemma linear, brown, scabrid, shorter than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37' N, 42°39'15.44"E).

*Eragrostis cilianensis* (All.) Janch.

Plant annual, green, height 38–53cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 5–6cm, width 1–2cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 16–27cm. Peduncle glabrous, length 8–16cm. Number of florets per spike 10 or more. Spikelets pedicelled, length 7–9mm. Upper glume linear, glabrous, brown, length 1–2mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, brown, length 0.5–1mm, tip acute-acuminate, margin entire. Lemma ovate, brown, scabrid, shorter than glumes. Awn length 0mm.

*Collection data:* (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E).

*Eragrostis lepida* (A.Rich.) Hochst. ex Steud.

Plant annual, yellow, height 7–9cm. Culm erect, glabrous, cylindrical. Node light brown.

Leaf blade linear, flat, length 7–9 cm, width 2–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous. Sheath shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, brown, length 15–24cm. Peduncle glabrous, length 2–11cm. Number of florets per spike 2–9. Spikelets pedicelled, length 1–2mm. Upper glume linear, membranous, green, length 1–1.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, membranous, green, length 0.5–1mm, tip acute-acuminate, margin entire. Lemma ovate, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E).

*Eragrostis papposa* (Desf. ex Roem. & Schult.) Steud.

Plant perennial, yellow, height 46–66cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 7–19cm, width 2–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 12–22cm. Peduncle glabrous, length 3–7cm. Number of florets per spike 10 or more. Spikelets pedicelled, length 5–12mm. Upper glume linear, glabrous, cream-coloured, length 1.5–2mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 0.5–1.5mm, tip acute-acuminate, margin entire. Lemma ovate, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sandy, 16°56'02.0"N, 42°35'04.1"E).

*Eragrostis pilosa* (L.) Beauv.

Plant annual, yellow, height 49–55cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 10–22cm, width 1.5–2cm, apex filiform, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter

than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, green, length 18–28cm. Peduncle glabrous, length 6–15cm. Number of florets per spike 2–9. Spikelets pedicelled, length 7–9mm. Upper glume linear, glabrous, green, length 0.5–1mm, tip acute-acuminate, margin scabrous. Lower glume lanceolate, glabrous, green, length 0.2–0.5mm, tip acute-acuminate, margin scabrous. Lemma linear, cream-coloured, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E).

*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.

Plant perennial, green, height 63–82cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 9–23cm, width 2–4cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, brown, length 15–19cm. Peduncle glabrous, length 7–9cm. Number of florets per spike 2–9. Spikelets sessile and pedicelled, length 9–11mm. Upper glume linear, glabrous, green, length 9–11mm, tip acute-acuminate, margin villous. Lower glume lanceolate, glabrous, cream-coloured, length 8–10mm, tip acute-acuminate, margin hairy. Lemma linear, green, glabrous, shorter than glumes. Awn length 5–8mm.

*Collection data:* (2.3.2019, mountainous, 1705.8'15°N, 4324.1'05°E).

*Hyparrhenia hirta* (L.) Stapf

Plant perennial, reddish brown, height 65–95cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, rolled, length 7–25cm, width 1–3cm, apex filiform, margin smooth. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode completely, veins not prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, brown, length 12–18cm. Peduncle glabrous, length 3–4cm.

Number of florets per spike 2–9. Spikelets sessile and pedicelled, length 5–6mm. Upper glume linear, villous, brown, length 5–6mm, tip acute-acuminate, margin villous. Lower glume lanceolate, hairy, brown, length 5–6mm, tip acute-acuminate, margin hairy. Lemma linear, brown, glabrous, shorter than glumes. Awn length 19–27mm.

*Collection data:* (16.2.2019, gravels, 17°23'17.56"N, 42°41'51.34"E); (2.3.2019, mountainous, 1705.8'15°N, 4324.1'05°E).

*Lasiurus scindicus* Henrard

Plant perennial, green, height 44–104cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, rolled, length 8–15cm, width 1–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 8–12cm. Peduncle glabrous, length 2–6cm. Number of florets per spike 2–9. Spikelets sessile and pedicelled, length 6–8mm. Upper glume linear, villous, cream-coloured, length 4–5mm, tip acute-acuminate, margin villous. Lower glume lanceolate, hairy, cream-coloured, length 5–6mm, tip acute-acuminate, margin hairy. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (15.2.2019; sand dune; 17°01'08.4"N, 42°43'27.6"E); (16.2.2019, gravels, 17°35'39.4"N, 42°18'36.2"E).

*Leptotrichum senegalense* (Kunth) Clayton

Plant perennial, green, height 15–29cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, rolled, length 1–3cm, width 1–1.5cm, apex pungent, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, green, length 10–15cm. Peduncle glabrous, length 3–7cm. Number of florets per spike 2–9. Spikelets pedicelled, length 4–5mm. Upper glume linear, spinulose, brown, length 2.5–3mm, tip acute-acuminate, margin scabrous. Lower glume lanceolate, spinulose, brown, length 3–4mm, tip acute-acuminate, margin scabrous. Lemma linear,



brown, scabrid, shorter than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (18.1.2019, sandy, 16°08'58.27"N, 42°07'39.18"E); (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E); (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E).

*Melinis repens* (Willd.) Zizka

Plant perennial, yellow, height 35–49cm. Culm erect, glabrous, cylindrical. Node not coloured. Leaf blade linear, folded, length 3–7cm, width 1.5–2cm, apex acute-acuminate, margin smooth. Leaf blade upper surface hairy, rigid. Leaf blade lower surface hairy, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 7–12cm. Peduncle glabrous, length 2–3cm. Number of florets per spike 1. Spikelets pedicelled, length 2–2.5mm. Upper glume ovate, villous, cream-coloured, length 1.5–2mm, tip acute-acuminate, margin villous. Lower glume ovate, hairy, cream-coloured, length 0.5–1.5mm, tip acute-acuminate, margin hairy. Lemma ovate, green, hairy, shorter than glumes. Awn length 0mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E).

*Ochthochloa compressa* (Forssk.) Hilu

Plant perennial, green, height 38–60cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, folded, length 3–7cm, width 2–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, equal to internode, surrounding internode completely, veins not prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, digitate, yellow, length 6–13cm. Peduncle glabrous, length 3–11 cm. Number of florets per spike 2–9. Spikelets pedicelled, length 5–6mm. Upper glume linear, glabrous, cream-coloured, length 4–5mm, tip acute-acuminate, margin entire. Lower glume elliptic, glabrous, cream-coloured, length 3–4mm, tip acute-acuminate, margin entire. Lemma ovate, green, hairy, longer than glumes. Awn length 0mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (19.1.2019, sand-

loam, 1610.16<42°>N, 42°36'18.55>E); (25.1.2019, sand-loam, 17°16'07.9>N, 42°42'46.2>E); (25.1.2019, gravels, 17°19'34.5>N, 42°45'48.9>E).

*Odyssa mucronata* (Forssk.) Stapf

Plant perennial, green, height 30–57cm. Culm erect, glabrous, cylindrical. Node not coloured. Leaf blade linear, rolled, length 1.5–4cm, width 1–2cm, apex pungent, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, longer than internode, surrounding internode completely, veins not prominent, tip not auriculate, colour same as culm. Ligule absent. Inflorescence simple spike, globose, yellow, length 2–2.5cm. Peduncle glabrous, length 0.5–1cm. Number of florets per spike 2–9. Spikelets pedicelled, length 7–9mm. Upper glume linear, glabrous, green, length 3–4mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, green, length 2–3mm, tip acute-acuminate, margin entire. Lemma elliptic, cream-coloured, hairy, longer than glumes. Awn length 0mm.

*Collection data:* (15.2.2019, clay, 17°05'47.2"N, 42°46'55.1"E); (9.3.2019) sand dune, 17°19'10.57"N, 42°43'06.39>E).

*Panicum antidotale* Retz.

Plant perennial, green, height 58–82cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 13–26cm, width 5–10cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, green, length 12–23cm. Peduncle glabrous, length 5–15cm. Number of florets per spike 1. Spikelets pedicelled, length 2–3mm. Upper glume elliptic, glabrous, green, length 2–3mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, green, length 1–2mm, tip obtuse, margin entire. Lemma ovate, cream-coloured, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sand-loam, 1610.16<42°>N, 42°36'18.55>E); (25.1.2019, sand-loam, 17°09'28.9>N, 42°41'35.0>E); (8.3.2019, sand-loam, 16°47'25.14>N, 42°33'00.30>E).

*Panicum coloratum* L.

Plant perennial, green, height 84–105cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 18–33cm, width 3–7cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scariosus. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 25–42cm. Peduncle glabrous, length 16–22cm. Number of florets per spike 1. Spikelets pedicelled, length 4–5mm. Upper glume linear, spinulose, cream-coloured, length 4–5mm, tip awned, margin villous. Lower glume lanceolate, spinulose, cream-coloured, length 3–4mm, tip acute-acuminate, margin hairy. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E).

*Panicum maximum* Jacq.

Plant perennial, green, height 86–142cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 18–35cm, width 5–11cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface hairy, scariosus. Leaf blade lower surface hairy, scariosus. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, green, length 20–48cm. Peduncle glabrous, length 6–16 cm. Number of florets per spike 1. Spikelets pedicelled, length 2.5–3mm. Upper glume linear, glabrous, brown, length 2–2.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, brown, length 1–1.5mm, tip obtuse, margin entire. Lemma ovate. Lemma green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (16.2.2019, gravels, 17°28'47.18"N, 42°38'30.02"E); (1.3.2019, sandy, 16°53'08.5"N, 42°24'39.0"E), (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Panicum turgidum* Forssk.

Plant perennial, green, height 62–110cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 3–7cm, width 3–8cm, apex acute-acuminate, margin smooth. Leaf blade upper

surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip auriculate, colour lighter than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 9–16cm. Peduncle glabrous, length 3–9cm. Number of florets per spike 1. Spikelets pedicelled, length 2.5–3.5mm. Upper glume linear, glabrous, green, length 2.5–3mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, green, length 2.5–3mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (18.1.2019, sandy, 16°08'58.27"N, 24°07'39.18"E); (25.1.2019, sand-loam, 17°16'07.9"N, 42°42'46.2"E); (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E); (9.2.2019, sandy, 16°58'42.3"N, 42°45'28.9"E); (15.2.2019, sand dune; 17°01'08.4"N, 42°43'27.6"E); (9.3.2019, sand dune, 17°19'10.57"N, 42°43'06.39"E).

*Paspalidium desertorum* (A. Rich.) Stapf

Plant perennial, green, height 23–35cm. Culm runner, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 5–16cm, width 3–5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins prominent, tip not auriculate, colour same as culm. Ligule glabrous. Inflorescence simple spike, elongate, green, length 8–20cm. Peduncle glabrous, length 2.5–8cm. Number of florets per spike 1. Spikelets pedicelled, length 2.5–3mm. Upper glume linear, glabrous, green. Upper glume length 1.5–2mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, green, length 1–1.5mm, tip obtuse, margin entire. Lemma elliptic, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (19.1.2019, sand-loam, 16°10'16.42"N, 42°36'18.55"E); (15.2.2019, clay, 17°05'47.2"N, 42°46'55.1"E); (16.2.2019, sandy, 17°28'47.18"N, 42°31'06.53"E); (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E); (1.3.2019, sandy, 16°53'08.5"N, 42°24'39.0"E).

*Pennisetum setaceum* (Forssk.) Chiov.

Plant perennial, green, height 90–115cm. Culm erect, glabrous, cylindrical. Node light brown.



Leaf blade linear, folded, length 16–46cm, width 2–4cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 26–30cm. Peduncle glabrous, length 10–14cm. Number of florets per spike 1. Spikelets pedicelled, length 4–5mm. Upper glume linear, glabrous, cream-coloured, length 4.5–5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1.5–2.5mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Schoenfeldia gracilis* Kunth

Plant annual, green, height 44–76cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 14–27cm, width 1.5–3cm, apex filiform, margin with hispid papillae. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, digitate, green, length 13–30cm. Peduncle glabrous, length 7–16cm. Number of florets per spike 1. Spikelets pedicelled, length 4–5mm. Upper glume linear, glabrous, cream-coloured, length 2.5–3mm, tip acute-acuminate, margin scabrous. Lower glume lanceolate, glabrous, cream-coloured, length 2–2.5mm, tip acute-acuminate, margin scabrous. Lemma linear, green, hairy, shorter than glumes. Awn length 20–27mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (25.1.2019, gravels, 17°19'34.5"N, 42°45'48.9"E); (26.2.2019, sand-loam, 16°57'40.4"N, 42°33'14.0"E).

*Setaria megaphylla* (Steud.) T. Durand & Schinz

Plant perennial, green, height 100–130cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade lanceolate, flat, length 38–58cm, width 15–20cm, apex acute-acuminate, margin with hispid papillae. Leaf blade upper surface hairy, scarios.

Leaf blade lower surface hairy, scarios. Sheath glabrous, equal to internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, green, length 39–50cm. Peduncle scarios, length 4–6 cm. Number of florets per spike 1. Spikelets pedicelled, length 2.5–3mm. Upper glume linear, glabrous, brown, length 1.5–2.5mm, tip awned, margin entire. Lower glume lanceolate, glabrous, brown, length 1–1.5mm, tip acute-acuminate, margin entire. Lemma linear, brown, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Setaria verticillata* (L.) P. Beauv.

Plant perennial, brown, height 48–60cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, flat, length 15–18cm, width 5–7cm, apex filiform, margin with hispid papillae. Leaf blade upper surface hairy, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, equal to internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, green, length 8–11cm. Peduncle scarios, length 2–4cm. Number of florets per spike 2–9. Spikelets pedicelled, length 1.5–2.5mm. Upper glume linear, membranous, cream-coloured, length 1–2mm, tip acute-acuminate, margin entire. Lower glume lanceolate, membranous, cream-coloured, length 0.5–1mm, tip obtuse, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (1.3.2019, sandy, 16°53'08.5"N, 42°24'39.0"E).

*Sporobolus helvolus* (Trin.) T. Durand & Schinz

Plant perennial, green, height 35–58cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 2–7cm, width 1.5–2cm, apex pungent, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, yellow, length 11–17cm. Peduncle glabrous, length 2–5 cm. Number of florets per spike 1. Spikelets pedicelled, length 1–1.5mm. Upper glume linear, glabrous, cream-

coloured, length 1–1.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1–1.5mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E).

*Sporobolus minutus* Link

Plant annual, yellow, height 25–37cm. Culm erect, glabrous, cylindrical. Node not coloured. Leaf blade linear, folded, length 3–5cm, width 0.5–1.5cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode, veins not prominent, tip not auriculate, colour lighter than culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, green, length 8–19cm. Peduncle glabrous, length 3–13cm. Number of florets per spike 1. Spikelets pedicelled, length 1–1.5mm. Upper glume linear, glabrous, cream-coloured, length 0.5–1mm, tip acute-acuminate, margin scabrous. Lower glume lanceolate, glabrous, cream-coloured, length 0.5–1mm, tip acute-acuminate, margin scabrous. Lemma ovate, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (1.3.2019, sandy, 16°53'08.5"N, 42°24'39.0"E).

*Sporobolus pellucidus* Hochst.

Plant perennial, green, height 77–100cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, flat, length 37–56cm, width 3–5cm, apex filiform, margin with hispid papillae. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, equal to internode, surrounding internode partially, veins not prominent, tip auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, green, length 46–55cm. Peduncle glabrous, length 10–12cm. Number of florets per spike 1. Spikelets pedicelled, length 2–2.5mm. Upper glume linear, glabrous, cream-coloured, length 2–2.5mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1.5–2mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (16.2.2019, gravels,

17°28'47.38"N, 42°38'30.02"E).

*Sporobolus pyramidalis* P. Beauv.

Plant perennial, green, height 43–68cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, folded, length 8–12cm, width 1.5–2cm, apex acute-acuminate, margin with hooked appendages. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, green, length 23–30cm. Peduncle glabrous, length 5–8cm. Number of florets per spike 1. Spikelets pedicelled, length 2–2.5mm. Upper glume oblong, glabrous, green, length 1.5–2mm, tip obtuse, margin entire. Lower glume ovate, glabrous, green, length 1.5–2mm, tip obtuse, margin entire. Lemma elliptic, cream-coloured, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (25.1.2019, sand-loam, 17°09'28.9"N, 42°41'35.0"E).

*Sporobolus spicatus* (Vahl) Kunth

Plant perennial, green, height 21–30cm. Culm runner, glabrous, cylindrical. Node light brown. Leaf blade linear, folded, length 2–5cm, width 1.5–2cm, apex pungent, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface glabrous, rigid. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 5.5–10cm. Peduncle scarios, length 1.5–3cm. Number of florets per spike 1. Spikelets pedicelled, length 1.5–2mm. Upper glume linear, glabrous, cream-coloured, length 1.5–2mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 1–1.5mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 0mm.

*Collection data:* (22.2.2019, sandy, 16°42'35.2"N, 41°58'55.7"E).

*Stipagrostis hirtigluma* (Steud. ex Trin. & Rupr.) De Winter

Plant annual, green, height 53–62cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 6–13cm, width 1–2cm, apex

filiform, margin spiny. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode completely, veins prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 22–30cm. Peduncle glabrous, length 4–11cm. Number of florets per spike 1. Spikelets pedicelled, length 10–14mm. Upper glume linear, villous, cream-coloured, length 10–13mm, tip acute-acuminate, margin villous. Lower glume lanceolate, hairy, cream-coloured, length 7.5–9mm, tip acute-acuminate, margin entire. Lemma linear, brown, scabrid, shorter than glumes. Awn length 50–60mm.

*Collection data:* (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E); (16.2.2019, gravels, 17°28'47.38"N, 42°38'30.02"E).

*Stipagrostis multinerva* H. Scholz

Plant perennial, yellow, height 77–89cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade linear, folded, length 8–11cm, width 1–2cm, apex filiform, margin spiny. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode completely, veins prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 17–28cm. Peduncle glabrous, length 6–11cm. Number of florets per spike 1. Spikelets pedicelled, length 9–15mm. Upper glume linear, glabrous, cream-coloured, length 8–10mm, tip acute-acuminate, margin entire. Lower glume lanceolate, spinulose, cream-coloured, length 7–8mm, tip acute-acuminate, margin scabrous. Lemma linear, brown, scabrid, shorter than glumes. Awn length 29–40mm.

*Collection data:* (9.2.2019, sand dune, 16°59'09.8"N, 46°46'09.9"E).

*Stipagrostis plumosa* Munro ex T. Anderson

Plant perennial, green, height 69–74cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 8–12 cm, width 1.5–2cm, apex filiform, margin spiny. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, longer than internode, surrounding internode completely, veins prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense

spike-like panicle, elongate, yellow, length 23–28cm. Peduncle glabrous, length 5–9cm. Number of florets per spike 1. Spikelets pedicelled, length 7–10mm. Upper glume linear, glabrous, cream-coloured, length 8–9mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 6–7.5mm, tip acute-acuminate, margin entire. Lemma linear, brown, scabrid, shorter than glumes. Awn length 36–46mm.

*Collection data:* (19.1.2019, sandy, 16°56'02."N, 42°35'04."E).

*Stipagrostis uniplumis* (Licht.) De Winter

Plant perennial, yellow, height 58–66cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 7–10cm, width 1–2cm, apex filiform, margin spiny. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous. Sheath shorter than internode, surrounding internode completely, veins prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence dense spike-like panicle, elongate, yellow, length 20–26cm. Peduncle glabrous, length 5–11cm. Number of florets per spike 1. Spikelets pedicelled, length 7–11mm. Upper glume linear, glabrous, cream-coloured, length 8–9mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 6–7.5mm, tip acute-acuminate, margin entire. Lemma linear, brown, scabrid, shorter than glumes. Awn length 39–44mm.

*Collection data:* (17.11.2018, gravels, 17°20'43.37"N, 42°39'15.44"E); (25.1.2019, sand-loam, 17°16'07.9"N, 42°42'46.2"E); (25.1.2019, gravels, 17°19'34.5"N, 42°45'48.9"E); (16.2.2019, gravels, 17°28'47.38"N, 42°38'30.02"E).

*Tetrapogon cenchriformis* (A. Rich.) Clayton

Plant annual, green, height 30–56cm. Culm erect, glabrous, cylindrical. Node black. Leaf blade linear, folded, length 2–4cm, width 2–3cm, apex acute-acuminate, margin smooth. Leaf blade upper surface glabrous, rigid. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence simple spike, elongate, yellow, length 5–10cm. Peduncle glabrous, length 2–5 cm. Number of florets per spike 2–9. Spikelets pedicelled, length 6–9mm.

Upper glume linear, glabrous, cream-coloured, length 7–9mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 5.5–7mm, tip acute-acuminate, margin entire. Lemma linear, green, hairy, longer than glumes. Awn length 6–9mm.

*Collection data:* (2.3.2019, mountainous, 17°15'05.8" N, 43°05'24.1" E).

*Themeda triandra* Forssk.

Plant annual, brown, height 84–100cm. Culm erect, glabrous, cylindrical. Node light brown. Leaf blade lanceolate, flat. Leaf blade length 10–18cm, width 2–3cm, apex acute-acuminate, margin with hooked appendages. Leaf blade upper surface hairy, scarios. Leaf blade lower surface hairy, scarios. Sheath glabrous, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour darker than culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, brown, length 15–40cm. Peduncle glabrous, length 5–7cm. Number of florets per spike 2–9. Spikelets sessile and pedicelled, length 7–10mm. Upper glume linear, glabrous, cream-coloured, length 7–10mm, tip acute-acuminate, margin entire. Lower glume lanceolate, glabrous, cream-coloured, length 6–7mm, tip acute-acuminate, margin entire. Lemma linear, green, glabrous, shorter than glumes. Awn length 4.5–8mm.

*Collection data:* (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

*Tricholaena teneriffae* (L. f.) Link

Plant perennial, yellow, height 43–76cm. Culm erect, hairy, cylindrical. Node light brown. Leaf blade linear, flat, length 8.5–12cm, width 2–4cm, apex acute-acuminate, margin hairy. Leaf blade upper surface hairy, rigid. Leaf blade lower surface hairy, rigid. Sheath hairy, shorter than internode, surrounding internode partially, veins not prominent, tip not auriculate, colour same as culm. Ligule a tuft of hairs. Inflorescence open spike-like panicle, elongate, green, length 12–21cm. Peduncle hairy, length 2–8cm. Number of florets per spike 2–9. Spikelets pedicelled, length 5–6mm. Upper glume ovate, villous, cream-coloured, length 5–6 mm, tip acute-acuminate, margin villous. Lower glume ovate, spinulose, cream-coloured, length 4–5mm, tip acute-acuminate, margin hairy. Lemma linear, green, hairy, shorter than glumes. Awn length 0mm.

*Collection data:* (2.3.2019, mountainous, 17°15'05.8"N, 43°05'24.1"E).

## Discussion

The present study is the first attempt to apply computer programs to constructing conventional identification keys to the flora of KSA or any other country in the Arabian Peninsula. The collection of 55 species from 31 genera of the grasses in Jazan region is relatively small and represents only about 20% and 30% of the species and genera of the Poaceae in KSA, respectively. Clearly, this study is by no means comprehensive but is intended merely to draw the attention to the much-needed improvement of the existing manually-constructed conventional keys of the local flora which suffer from a whole host of inconsistencies and shortcomings. The procedure followed in this study is equally applicable to the entire Poaceae of KSA simply by expanding the data matrix in the present study both in terms of taxa and characters. It is also equally applicable to wild and cultivated representatives of any other family. Among the likely candidates for similar studies are the families with relatively large representation in the flora of KSA and their keys are in need of much improvement such as the Fabaceae, Asteraceae, Bassicaceae, Amaranthaceae, Euphorbiaceae, Caryophyllaceae, and several others.

The computer-generated conventional key of the Jazan grasses is apparently an appreciable improvement over its traditional predecessors in several respects:

- (i) it is based on a strictly comparative set of 50 characters and not on a few characters chosen arbitrarily; the prelude to the key shows that the data matrix was so rich in characters that out of the 50 characters, only 22 were sufficient to construct the key,
- (ii) the full name of a species together with its author citation can be reached directly from the computer-generated key, whereas in a manually-constructed key to members of a family the user has to use a number of keys to identify an unknown specimen: one key to the genera, a second keys to the species of a genus, and possibly a third key to infra-specific taxa of a species,
- (iii) it is much easier to use than the manually-constructed keys where the name of every taxon



in the key can be reached by only a few of the recorded characters, while the remaining characters appear in the description of the taxon and serve the all-important function of confirming its identity; for example, the name *Ochthochloa compressa* can be reached in the key through only four entries (23, 27, 32 and 34) involving eight character-states (inflorescence open spike-like panicle, leaf blade margin smooth, lemma ovate, number of florets per spike 2-9, leaf blade folded, plant green, sheath equal to internode, inflorescence yellow), thus leaving the states of no less than the other 42 characters to single out this species from the rest; no other species in the key shares the same combination of the eight character-states with *O. compressa*.

(iv) the data matrix remains open to any future changes in the nomenclature and attributes of the plants and continuous updating and improvements of the key are easily achievable.

*Conflict of interests:* The authors declare no conflict of interest.

*Authors contribution:* The second third authors collected and identified all plant specimens and compiled the data matrix. The first author verified and updated the nomenclature of plants, revised the data matrix and generated the key. All authors shared equally in preparing the article for publication.

*Ethical approval:* Not applicable.

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## مفاتيح آلية ووصف آلي لفلورة المملكة العربية السعودية: دراسة إستطلاعية على بعض نباتات الفصيلة النجيلية من منطقة جازان

عادل إبراهيم حامد الجزار<sup>(1)</sup>، عائشة سعيد معيض العمري<sup>(2)</sup>، لمياء فاروق شلبي<sup>(3)</sup>  
<sup>(1)</sup> قسم النبات والميكروبيولوجي - كلية العلوم - جامعة العريش - شمال سيناء - مصر، <sup>(2)</sup> قسم العلوم البيولوجية - كلية العلوم - جامعة جازان - جازان - المملكة العربية السعودية، <sup>(3)</sup> قسم العلوم البيولوجية والجيولوجية - كلية التربية - جامعة عين شمس - القاهرة - مصر.

هذا هو أول استخدام لبرامج الحاسب الآلي المتخصصة في بناء مفاتيح تعريف النباتات وتوصيف النباتات في فلورة المملكة العربية السعودية أو في أي من الدول الأخرى في شبه الجزيرة العربية. فقد تم استخدام حزمة برامج «دلنا» لإنشاء مفتاح لتعريف 55 نوع من نباتات الفصيلة النجيلية من منطقة جازان بالمملكة العربية السعودية على أساس قاعدة بيانات تضم 50 صفة مورفولوجية سهلة المشاهدة تم تسجيلها لكل نوع في مصفوفة بيانات تضم كل الأنواع. في عملية الحاسب الآلي يتم تحويل مصفوفة البيانات إلى صورة رقمية (الصفات تأخذ أرقام مسلسلة وحالات الصفة الواحدة تأخذ أرقام مسلسلة ويلى إسم كل نوع نباتي صفاته وحالاتها بأرقامهم المسلسلة). وتنتج عملية تحليل مصفوفة البيانات ببرنامج «دلنا» مفتاح لتعريف النباتات مصحوباً بوصف لكل نبات يشتمل على كل الصفات الخمسين المسجلة له كي يُستفاد منها في تأكيد تعريفه. المفاتيح الآلية تفوق كثيراً نظائرها التقليدية من حيث أنها: (1) على قدر كبير من المرونة ويمكنها بسهولة أن تستوعب المزيد من النباتات والصفات، (2) تؤدي باستمرار إلى نفس النتائج، (3) يمكن بسهولة تحويلها إلى مفاتيح تفاعلية عند رفعها على أحد مواقع الإنترنت فتصبح متاحة عالمياً. هذه الدراسة تم إجراؤها لتكون نموذجاً لدراسات أخرى تهدف إلى تطوير دراسة الفلورة في المملكة العربية السعودية والخطوات المتبعة فيها يسهل تطبيقها على كل المجموعات النباتية الأخرى البرية والمزروعة في المملكة.