J. King Saud Univ., Vol. 1, *Science* (1,2), pp. 5–19, Riyadh (1409/1989)

Antibacterial Wild Flowering Plants in Saudi Arabia

Ali A. Salamah*, Hassan M. Hassan and **Taha M. Nassar**
Botany Department, College of Science, King Saud University, P. O. Box 2455, Riyadh 11451, Saudi Arabia

(Received 4 May 1987; accepted for publication 20 October 1987)

Abstract. Wild plants were collected from their natural habitats in Riyadh area (Saudi Arabia). Extracts of leaves and/or fruits were tested for antibacterial action. Twelve bacterial species were employed and the reactions noted. The results disclosed the importance of such studies and call for further investigations. They also explained some commonplace folklore medicinal applications and practices.

Introduction

Wild plants have been selected by trial and error throughout history for their value as food or medicinal sources. Folklore medical practices rarely specify a single species and nations differ in their ways of preparation and treatment. Saudi Arabia is but one exemplar. The purpose of this paper is not to verify the medicinal value of a taxon growing in the wild noted for its curing properties in particular diseases, but to examine any wild plant along a certain line of research – the antibacterial reaction possessed by the plant extract. The results are not only promising but also disclose a new area of importance of these taxa and of those still to be examined.

Materials and Methods

Sources of plants and bacteria tested

Flowering taxa, localities date of collection, part used and the general distribution in Saudi Arabia are shown in Table 1 (Figs. 1 and 2). Bacterial strains and their sources are given in Table 2. These strains were selected as test organisms because

* Corresponding author.

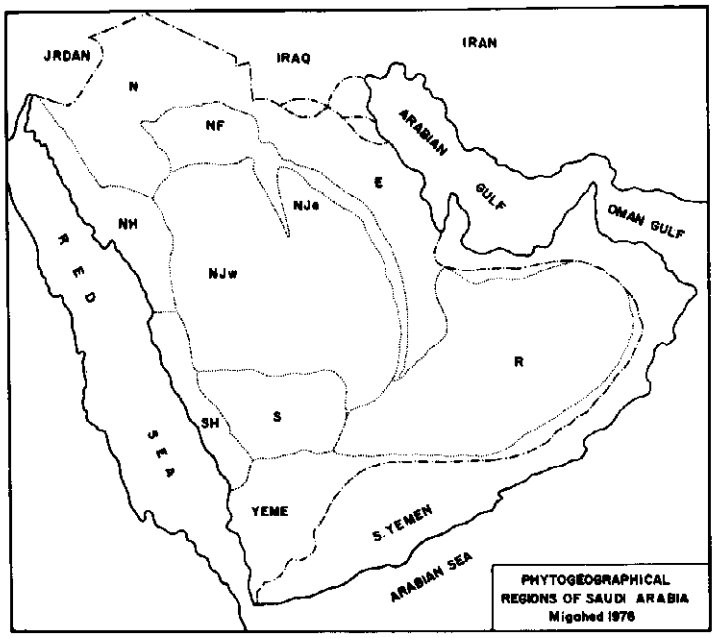

Fig. 1. Map of Saudi Arabia showing Migahed's phytogeographical regions [1].

they cover a whole range of structures which are usually the target of the antibacterial agents. The strains were grown on blood agar base (Difco) slants and maintained at 4°C with monthly transfers.

Extraction of leaves and/or fruits

Five grams of leaves and/or fruits of each plant specimen were homogenized with 5 ml of sterile distilled water, filtered through Whatman No. 1 filter paper then through 0.45 Millipore filter and the filtrates sotred at 4°C in small sterile test-tubes until use.

Antibacterial effect of the extracts

The bacterial strains were grown in brain heart infusion broth (Difco) for 8 hr at 37°C. Each culture was then spread on brain heart infusion agar plates (0.1 ml/plate). 0.1 ml of each plant extract to be tested was then absorbed onto sample application piece (LKB) for 5 min. The sample application pieces were then placed on the sur-

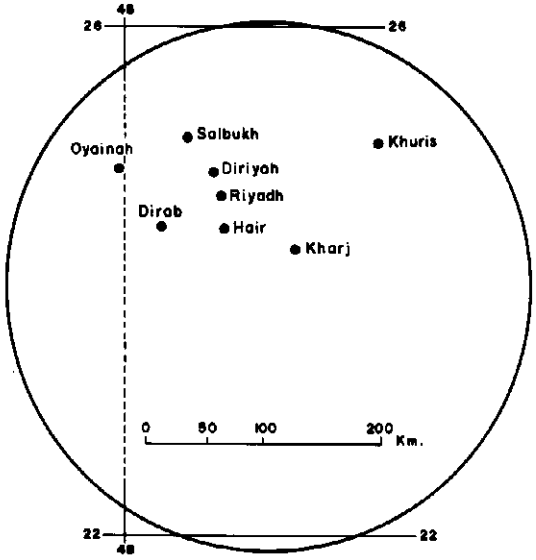

Fig. 2. Sketch map of Riyadh (Saudi Arabia) showing localities from which wild plants were collected.

face of the brain heart infusion agar plates immediately after their inoculation with the test bacterium. The plates were incubated for 24 hr at 37°C and the inhibition was recorded (Fig. 3).

Results and Discussion

These are shown in Table 3, where the source of extract is given the same number for the taxon as presented in Table 1 and the bacterial strains given the same lettering (A–L) as in Table 2. From Table 3, the following data are concluded:

1. Aerva javanica

The leaf extract is effective against *Klebsiella pneumoniae, Staphylococcus epidermidis* and *Streptococcus faecalis.* To the authors knowledge, there is no previ-

Table 1. Taxa, locality date of collection, part used and distribution in Saudi Arabia

Taxon	Locality and date of collection	Part used	General distribution in Saudi Arabia [1]
Amaranthaceae:			
1. *Aerva javanica* (Burm. f.) Spreng.	Direyah, November/85	Leaves	NJ, N, NH, SH, S, E, NF, R.
Apocynaceae:			
2. *Rhazya stricta* Decne	Kharj old road, October/85	Leaves	NH, SH, N, S, NJe, NJw, E, R.
3. *Rhazya stricta*	Kharj old road, February/85	Fruits	
Asclepiadaceae:			
4. *Calotropis procera* (Ait.) Ait. f.	Riyadh-Higaz road, Oct./85	Leaves & fruits	NH, SH, N, NJ, NF, E, S.
5. *Pergularia tomentosa* L.	Direyah, November/85	Leaves	NH, SH, N, S, NJe, NF, E, R.
Boraginaceae:			
6. *Heliotropium lignosum* Schweinf. ex Bunge	Haradh-Kharj road, Feb./86		E.
Capparaceae:			
7. *Capparis spinosa* L.	Salbukh road, October/85	Leave & fruits	N, NH, NJ, E, R, SH, FN.
Cleomaceae:			
8. *Cleome arabica* L.	Direyah, February/86	Leaves	NH, NJ, E, NF, N.
Compositae:			
9. *Anvillea garcini* (burm. f.) DC.	Direyah, February/86	Leaves	NG, SH, NJ, NF, E, R.
10. *Rhanterium epapposum* Oliv.	Haradh road, November/85	Leaves	N, NJe, NJw, E, NF.
11. *Convolvulus arvensis* L.	Haradh road, November/85	Leaves	NH, SH, N, S. NJ, NF, E, R.
12. *C. prostratus* Forssk.	Haradh road, November/85	Leaves	SH, NJ.
Cruciferae:			
13. *Diplotaxis harra* (Forssk.) Boiss.	Direyah, February/86	Leaves	NH, N, S, NJ, E.
14. *Farsetia aegyptia* Turra	Dirab, February/86	Leaves	NH, N, NJ, E.
Cucurbitaceae:			
15. *Citrullus colothynsis* (L.) Schrad.	Wadi El-Jafi, September/85	Leaves	NH, SH, N, S, NJ, NF, E, R.
Euphorbiaceae:			
16. *Euphorbia granulata* Forssk.	Haradh road, November/85	Leaves	NH, NJe.
17. *E. heliscoparia* L.	Al-Hair, February/86	Leaves	NH, NJ.
18. *E. peplus* L.	Al-Hair, February/86	Leaves	NH, SH, NJ, E.
19. *Ricinus communis* L.	Kharj old road, October/85	Leaves	NJ, NF, SH, E, S.
Labiatae:			

Table 1. *Continued.*

	Taxon	Locality and date of collection	Part used	General distribution in Saudi Arabia [1]
20.	*Salvia spinosa* L. Leguminosae:	Direyah, October/85	Leaves	SH, NJe.
21/22.	*Cassia italica* (Mill.) Lam. ex. Steud. Malvaceae	Wadi El-Jafi, September/85	Leave & fruits	NH, N, S, NJ, NF, E, R.
23.	*Malva parviflora* L. Moraceae:	Kharj-Haradh road, Feb./86	Leaves	NH, N, NJe, NJw, E, NF, R.
24/25.	*Ficus palmata* Plantaginaceae:	Salbukh road, October/85	Leaves & fruits	NJ.
26.	*Plantago lanceolate* L. Polygonaceae:	Al-Oyainah, October/85	Leaves	NJe, E.
27.	*Rumex vesicarius* L. *Primulaceae:*	Direyah, February/86	Leaves	SH, S, NJe, E.
28.	*Angallis arvensis* L. Rutaceae:	Al-Hair, February/86	Leaves	NJ.
29.	*Haplophyllum tuberculatum* (Forssk.) A.Juss Scrophulariaceae:	Kharj-Harrad road, February/86	Leaves	NJ, NJ, SH, E.
30.	*Scrophularia deserti* Del. Solanaceae:	Direyah, February/86	Leaves	N, NJe, NF, E.
31/32.	*Datura stramonium* L.	Riyadh-Hijaz road, Oct./85	Leaves& fruits	NH, S, N, NJe, E, NF.
33.	*Lycium shawii* Roem. el Sch.	Direyah, February/86	Leaves	NH, SH, S, N, NJe, E, NF.
34.	*Solanum nigrum* L.	Al-Hair, September/85	Leaves	NH, SH, N, S, NJe, E.
35/36.	*Withania somnifera* (L.) Dun. in DC. Umbelliferae:	Al-Hair, September/85	Leaves & fruits	NH, SH, S, NJe, E.
37.	*Ducrosia ismaelis* Asch. Zyojophyllaceae:	Direyah, February/86	Leaves	NJe, NJw.
38.	*Peganum harmale* L.	Haradh road, October/85	Leaves	N, NJ, NJe, E.
39.	*Zygophyllum album* L.f.	Kharj-Haradh road, Feb./86	Leaves	N, NH, SH, NJe, E.

Table 2. Bacterial strains and their code identity and source

Organism	Code identity	Code meaning
A *Bacillus subtilis*	ATCC 6051	American Type culture Collection, U.S.A.
B *Escherichia coli* Strain B	ATCC 11775	-do-
C *Klebsiella pneumoniae*	CBSC 15-5095A	Carolina Biological Supply Company, U.S.A.
D *Salmonella typhi*	KKUH 1012	King Khalid University Hospital, Saudi Arabia.
E *S. typhimurium*	NCTC 73	National Collection of Type Cultures, England.
F *Shigella flexneri*	KKUH 11286	King Khalid University Hospital, Saudi Arabia.
G *S. sonnei*	KKUH 934	-do-
H *Staphylococcus aureus*	CBSC 15-5555A	Carolina Biological Supply Company, U.S.A.
I *S. epidermidis*	CBSC 15-556A	-do-
J *Streptococcus faecalis*	NCTC 370	National Collection of Type Cultures, England.
K *Yersinia enterocolitica*	NCTC 10466	-do-
L *Y. pseudotuberculosis*	NCTC 824	-do-

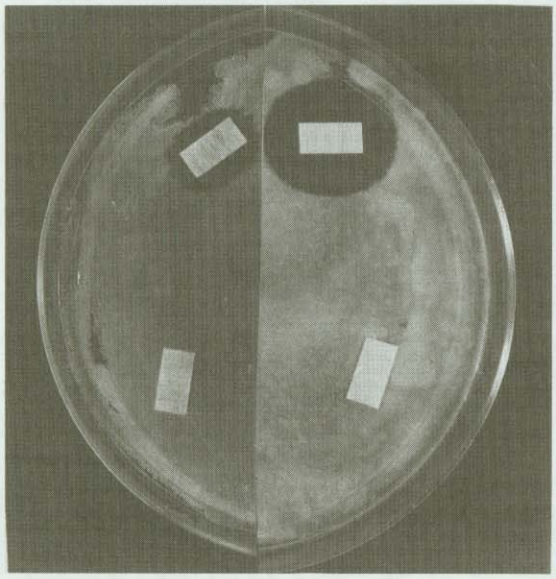

Fig. 3. Antibacterial effect of extract of some wild plants showing the zone of inhibition around the two sample application pieces at the above and the lack of the zone of inhibition around the two sample application pieces at the bottom.

Table 3. Antibacterial effect of extracts of flowering plant specimens 1–39 on bacterial strains A–L

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
A	–	+	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–
B	–	+	+	+	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	+	–	–	+	–	–	–	–	–	–	–	–	–	–	+	–	+	–
C	+	–	–	–	+	–	+	+	–	+	–	–	–	–	+	+	–	–	+	+	+	+	–	+	+	–	+	–	+	–	–	–	+	+	+	+	+	+	+
D	–	–	–	–	–	–	–	–	+	–	+	–	–	–	–	+	+	–	–	–	–	–	–	–	+	+	–	–	–	–	–	–	+	–	–	–	–	–	–
E	–	–	–	–	–	–	+	–	–	–	–	+	–	–	–	+	–	–	+	–	–	–	–	+	+	–	–	–	+	–	–	–	–	–	–	+	–	–	–
F	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–	–	+	–	+	–	–	–	–	–	–	–	–	–
G	–	–	–	–	–	–	–	–	+	+	–	–	–	+	–	–	–	+	–	–	–	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–
H	–	–	+	–	–	+	–	+	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	+	–	–	–	–	+	–	–	–	–	+	+	–	–
I	+	–	–	+	–	–	+	–	+	+	–	–	+	–	–	+	–	–	–	+	–	–	+	–	–	–	–	–	–	–	+	–	–	–	–	–	+	–	–
J	+	–	+	–	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–
K	–	+	–	+	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–	–	+	–	–	–	+	–	–	–	+	–	–
L	–	+	–	–	–	–	+	–	+	–	–	–	–	–	–	–	–	–	+	+	–	+	–	–	–	+	–	–	–	+	–	+	–	–	–	–	–	–	–

ous record of *Aerva javanica* possessing an antibacterial leaf-extract. No medicinal use is reported for this taxon.

2,3. Rhazya stricta

The leaf-extract of this plant is effective against *Bacillus subtilis, Escherichia coli, Yersinia enterocolitica* and *Y. pseudotuberculosis*. There is no reference indicating that *Rhazya* leaf-extract has such properties. The same is true of the fruit-extract which is effective against the first two mentioned organisms and also attacks *Staphylococcus aureus* and *Streptococcus faecalis*. No medicinal use has been reported for this taxon. These two extracts are therefore recommended for further analysis.

4. Calotropis procera

The leaf-extract of this plant is effective against *Bacillus subtilis, Escherichia coli, Staphylococcus epidermidis*, and *Yersinia enterocolitica*. *Calotropis procera* is reported by several sources [2] to have been used in the treatment of some cutaneous infections. Morton [3] states that the latex is antisyphilitic and is also inserted into painful tooth cavities and applied to various skin complaints. This may support our detection of antibacterial effect.

5. Pergularia tomentosa

The leaf-extract of this plant works only against one organism *Klebsiella pneumoniae*. Boulos [4] says that the plant is used for skin diseases. This may be attributed to our detection of antibacterial effect of the extract.

6. Heliotropium lignosum

Leaf-extract of this plant works against *Staphylococcus aureus* only. No medical value has been cited for this taxon, at least in Saudi Arabia.

7. Capparis spinosa

Leaf-extract of this plant is effective against *Klebsiella pneumoniae, Salmonella typhimurium, Staphylococcus epidermidis*, and *Yersinia enterocolitica*. Kotb [5] says that the plant in the form of compresses is used in ophthalmic diseases. The same observation was reported by Boulos [4]. Schauenberg [6] says that the flower buds and roots are renal disinfectants and confirms the use in compresses for eyes. All these usages are indicative of the antibacterial effect reported in this paper.

8. Cleome arabica

Leaf-extract is effective on *Klebsiella pneumoniae* and *Staphylococcus aureus*. There is no previous record of the uses of this plant in folk or modern medicine. The plant is recommended for further studies.

9. Anvillea garcini

What is interesting about this plant is its weedy troublesome nature. Now it

seems to be very valuable. The leaf-extract is effective against several of the bacterial strains used: *Salmonella typhi, Shigella flexneri, S. sonnei, Staphylococcus epidermidis, Streptococcus faecalis, Yersinia enterocolitica* and *Y. pseudotuberculosis.* There is no record of the employment of this plant in medicine or folk-medicine in Saudi Arabia. The plant is therefore recommended for further investigation.

10. Rhanterium epapposum

Leaf extract of this plant is antibacterial to several test organisms e.g. *Klebsiella pneumoniae, Shigella sonnei, Staphylococcus epidermidis, Streptococcus faecalis,* and *Yersinia enterocolitica.* There is no previous record of the use of this plant in medicine in Saudi Arabia. The plant is a characteristic pasture element much liked by grazing animals. Its antibacterial properties now suggest this plant be further investigated.

11. Convolvulus awensis

Leaf-extract works against one organism i.e. *Salmonella typhi.* Karel and Roach [7] say that fruit and leaves have given negative antibiotic tests. Hayes as quoted by Watanabe et al.[8] mentions that the leaf, stem, and root have shown some antibiotic effects on *Erwinia carotovora.* Kotb [5] says that the plant is used for the dressing of wounds. This could be explained by our finding of a specific action on *Salmonella typhi.*

12. Convolvulus prostrata

Leaf-extract is effective against *Salmonella typhimurium.* There is no reference to previous employment of this plant in folk medicine in Saudi Arabia but it shares with the above mentioned species the antibacterial action on *Salmonella spp.*

13. Diplotaxis harra

Leaf-extract specifically works against *Staphylococcus epidermidis.* There is no record of the use of this plant in medicine in Saudi Arabia.

14. Farsetia aegyptia

Leaf-extract specifically works against *Shigella sonnei.* There is no previous record of the use of this plant in medicine in Saudi Arabia.

15. Citrullus colocynthis

Leaf-extract is effective against *Escherichia coli* and *Klebsiella pneumoniae.* Much work has been done on the chemistry and medicinal value of this plant and it is much used in folk medicine. Boulos [4] says that veterinary preparations used for itch very often contain colocynth and that hot sap of the plant is used to cure certain skin diseases. This application is consistent with the anti-bacterial effect detected in the present paper.

16. Euphorbia granulata

Leaf-extract is effective against *Klebsiella pneumoniae, Salmonella typhi, S.*

typhimurium, and *Staphylococcus epidermidis*. There is little or almost no reference to the use of this plant in medicine. Only Boulos [4] reports that the latex is locally applied against poisonous bites. The plant is actively antibacterial and it needs further consideration.

17. E. heliscoparia

Leaf-extract is effective against *Salmonella typhi*. Watanabe et al. [8] have reported that the plant has given negative tests for antibacterial substances, this is contradictory to our finding that the leaf extract is specifically lethal to *Salmonella typhi*.

18. E. peplis

Leaf-extract is effective against *Shigella sonnei*. Kotb [5] says that the leaves are used for hepatic disorders. Boulos [4] confirms the usage for liver disorders, this observation is also made by Schauenberg [6]. The antibacterial effect noticed in the present work may, in part, explain these usuages knowing that heptic disorders may result from viral or bacterial infection.

19. Ricinus communis

Leaf-extract is detrimental to *Klebsiella pneumoniae*, *Salmonella typhimurium*, and *Yersinia enterocolitica*. Much work has been done on *Ricinus communis*. Madsen [9] reported that an extract of the leaf (pH 9.0 buffer) has been found to give a zone of inhibition 20 to 30 mm in diameter. Fernandez and Nunez [10] reported that the leaf-extract gave a zone of 18 mm with *Mycobacterium tuberculosis*. Solomides as quoted by Watt and Breyer-Brandwijk [11] reported that fractions distilled from castor oil at a high temperature are highly bactericidal to seven species of pathogenic microorganisms and fungicidal to some fungi. Boulos [4] reported that root-decoctions are applied to inflammatory affections, skin diseases, kidney and bladder troubles. Furthermore, he adds that cataplasm of leaves is applied for wounds, lacteral tumors, indurations of mammary glands, swellings etc. as well as an eye-lotion. He goes on to mention that cataplasm of fresh leaves cures boils, and that seed oil is used for tumors, boils, ophthalmic, wounds, kidney and bladder trouble and some parasitic skin diseases. All these applications imply an antibacterial action reported and confirmed in this work.

20. Salvia spinosa

Leaf-extract is antibacterial to *Klebsiella pneumoniae, Shigella flexneri, Staphylococcus aureus, S. epidermidis* and *Yersinia pseudotuberculosis*. According to Kotb [5] the plant is known to be insect repellent if hung in the room and that if seeds are soaked they form a thick mucilaginous drink used in gonorrhea and urethritis. No further medicinal use is reported. The plant is now seen to have an active leaf-extract against bacteria and we recommend it for further study.

21,22. Cassia italica

Leaf-extract of this plant is effective on *Klebsiella pneumoniae* while the fruit extract is effective on this organism and also on *Escherichia coli* and *Yersinia pseudotuberculosis*. Much work has been done on this plant. Morton [12] attributes the purgative effect to the presence of oxymethyl-lanthoro-quinone in the pods and leaves. Boulos [4] reported that crushed seeds are used for ophthalmic diseases, perhaps because of the antibacterial effect disclosed in the present paper.

23. Malva parviflora

Leaf-extract is only effective against *Staphylococcus epidermidis*. Kotb [5] says that boiled leaves are used to wash skin eruptions and that leaf infusions are used as douche for uterine troubles and as eye lotion.

24,25. Ficus palmata

Leaf-extract is effective against *Klebsiella pneumoniae* and *Salmonella typhimurium* while the fruit extract is effective against these two as well as *Escherichia coli, Salmonella typhi, Streptococcus faecalis,* and *Yersinia enterocolitica*. There is no reference to studies on this plant in relation to its medicinal value in Saudi Arabia. Now we realize its effect, especially the fruit extract on bacteria.

26. Plantago lanceolate

Leaf-extract is effective on *Salmonella typhi, Streptococcus foecalis* and *Yersinia pseudotuberculosis*. Felklova [13] has reported that an alcoholic extract especially of the young leaf is bactericidal. An aqueous extract, according to him, has no effect and both alcoholic and aqueous extracts are ineffective against *Escherichia coli*. This observation about *E. coli* is confirmed by our findings.

Kotb [5] says that the plant is used for tuberculosis and bladder irritations and that leaves in the form of ointment are used to heal fresh wounds and as eyedrops for conjunctiva and eye-lid inflamation.

27. Rumex vesicarius

Extract of leaf is effective against *Klebsiella pneumoniae, Shigella sonnei* and *Staphylococcus aureus*. Boulos [4] mentions that the plant is eaten fresh against jaundice, hepatic condition, constipation, and bad digestion. The antibacterial effect reported in the present paper may be relevant.

28. Anagalis arvensis

Leaf-extract is effective on *Bacillus subtilis* only. Watanabe *et al.* [8] reported that the green parts of the plant have given negative antibacterial tests. The plant contains an antibiotic anagalloside. Waren [14] says that "this plant possesses very active properties, although its virtues are not fully known (p. 237)". Kotb [5] says that the plant is applied externally to wounds, and ulcers and adds that it is an insect

repellant and an insecticide. Schauenberg [6] says that the plant contains cyclamine used to treat skin eruptions and ulcers.

29. Haplophyllum tuberculatum

Leaf-extract is effective on *Klebsiella pneumoniae Salmonella typhimurium, Shigella flexneri* and *Yersinia enterocolitica.* Boulos [4] says that the flowering and fruiting branches are used for eye and ear troubles.

30. Scrophularia desertii

Leaft-extract is effective only against *Yersinia pseudotuberculosis.* There is no previous record of such an antibacterial action for the extract of *Scrophularia desertii* in Saudi Arabia.

31,32. Datura stramonium

Leaf-extract is effective against *Shigella flexneri* while the fruit extract is effective against *Staphylococcus aureus, S. epidermidis* and *Yersinia pseudotuberculosis.* Karel and Roach [7] reported that the leaves have given negative antibiotic tests, but George [15] says that all parts of the plant are believed to produce some degree of antibiotic effect. Kotb [5] says that the fruit juice is applied to scalp to cure dandruff and falling hair.

33. Lycium shawii

Extract of leaves is detrimental to *Klebsiella pneumoniae, Salmonella typhi* and *Yersinia enterocolitica.* There is no previous record of any medicinal use of this plant in Saudi Arabia.

34. Solanum nigrum

Leaf-extract is effective only on *Klebsiella pneumoniae.* Grithens as quoted by Watt and Breyer-Brandwijk [11] states that in tropical and southern Africa the leaf and root are said to be used as a remedy for cough, colic, sore throat, gonorrhea and syphilis. Boulos [4] says that the plant is applied for skin afflictions and that crushed leaves are blended with petroleum jelly and bound on boils. He adds that leaf-decoction is dropped into inflamed eyes and aching ears. All these indicate an antibacterial action disclosed in the present paper.

35,36. Withania somnifera

Leaf-extract is effective on *Klebsiella pneumoniae* while the fruit extract is effective on Escherichia coli, and *Salmonella typhimurium* as well as *K. pneumoniae.* Bryant as quoted by Watt and Breyer-Brandwijk [11] reported the use of the plant in the cure of syphilis and he believes that the plant has antiseptic properties as the leaf is successfully employed in healing wounds. Kurup [16] reported that leaves and roots have shown marked antibiotic activities against *Staphylococcus aureus,* the leaf more active. Kotb [5] mentions that the plant contains an antibiotic Withaferin which has a broad spectrum action against bacteria and viruses.

37. Ducrosia ismaelis

Leaf-extract is effective on *Klebsiella pneumoniae, Staphylococcus aureus,* and *Yersinia enterocolitica.* There is no previous record on the use of this plant in medicine in Saudi Arabia.

38. Peganum harmala

Leaf-extract is effective against *Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus,* and *S. epidermidis.* Much work has been done on this plant. Kotb [5] states that the plant is antibacterial and protozoocidal. Boulos [4] says that the oil extracted from seeds is used for some infectious eye diseases and some skin diseases.

39. Zygophyllum album

Leaf-extract is effective only against *Klebsiella pneumoniae.* There is no record on the use of this plant in medicine or folklore medicine in Saudi Arabia.

In conclusion, we found that extracts of leaves and/or fruits of the following plants: *Rhazya stricta, Capparis spinosa, Anvillea garcini, Rhanterium epapposum, Euphorbia granulata, Ricinus communis, Salvia spinosa, Ficus palmata, Haplophyllum tuberculatum, Withania somnifera, Peganum harmala* were effective against several of the bacterial strains used mostly with great intensity. Therefore, the above eleven plants merit further study.

Acknowledgements: This research (Bot/1407/26) was supported by the Research Centre, College of Science, King Saud University, Riyadh, Saudi Arabia.

References

[1] **Migahed, A.M.** *Flora of Saudi Arabia.* Riyadh: King Saud University Publications, 1976.
[2] **Lindley, J.** *Flora Medica.* New Delhi: Ajay Book Service, 1981.
[3] **Morton, J.F.** *Medicinal Plants of Middle America.* Springfield, Illinois: Charles C. Thomas, 1981.
[4] **Boulos, L.** *Medicinal Plants of North Africa.* Reference Publication Inc. 1983.
[5] **Kotb, F.** *Medicinal Plants in Libya.* Beirut, Lebanon: Arab Encyclopedia House, 1985.
[6] **Schauenberg, P.** *Guide to Medicinal Plants.* Guildford, London: Latterwatt Press, 1977.
[7] **Karel, L.** and **Rouch, E.S.** *Dictionary of Antibiosis.* New York: Columbia Univ. Press, 1951.
[8] **Watanabe, T., Toyoshige, A., Koichio., Minora G** and **Homu, I.** *Chem. Abst.* **51** (1957), 8367.
[9] **Madsen, G.C.** "Occurrence of Antimicrobial Substance in Chlorophyllose Plants Growing in Florida." *Bot. Gaz.* **113** (1952), 293.
[10] **Fernandez, O.** and **Nuney, R.** "Analysis of Domestic Rusber Bearing Plants." *Chem Abst.* **41** (1947), 2599.
[11] **Watt, J.M.** and **Breyer-Brandwijk, M.G.** *The Medicinal and Poisonous Plants of South Africa.* Edinburg & London: E & S Livingstone Ltd., 1962.
[12] **Morton, J.F.** *Major Medicinal Plants Botany, Culture and Uses.* Springfield, Illinois: Charles and Thomas, 1973.
[13] **Felklova, M.** "Antibacterial Aqueous an Alcoholic Extracts of *Plantago lanceolate.*" Chem. Abst. **52** (1958), 9513.

[14] **Waren, C.** *Potter's New Cyclopedia of Botanical Drugs and Preparations.* Potter & Clarke Ltd., 1975.
[15] **George, M.** "Antibiotic Effect of *Detura stramonium," Indian J. Med. Res.* **37** (1949), 169.
[16] **Kurup, P.A.** "An Antibiotic and Antiviral Principle, *Chem. Abst.* **53** (1959), 16479.

نباتات برية مزهرة مضادة لنمو البكتيريا في المملكة العربية السعودية

علي العبدالله السلامة، حسن مصطفى حسن وطه محمد نصار

قسم النبـات، كلية العلوم، جامعـة الملك سعـود، ص.ب ٢٤٥٥ ، الـرياض ١١٤٥١ ، المملكة العربية السعودية

(أستلم في ٦ رمضان ١٤٠٧هـ، قُبل للنشر في ٢٧ صفر ١٤٠٨هـ)

ملخص البحث. تم جمع النباتات البرية من بيئاتها الطبيعية في منطقة الرياض (المملكة العربية السعودية) وقد استخدمت خلاصة الأوراق أو الثمار في الكشف عن أي تأثير ضد البكتيريا، وقد استخدم في هذا الشأن اثنا عشر نوعًا من أنواع البكتيريا. وتشير النتائج إلى أهمية مثل هذه الدراسات وتدعو إلى المزيد منها، وكذلك فإنها توضح بعض الخلفيات للاستخدامات العادية في الطب الشعبي لهذه النباتات.