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Apoidean biodiversity on *Salvadora persica* L. in the desert of Thar in Rajasthan

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Abstract
Common names for *Salvadora persica* (Linn.) include Pilu, Dholu, and Mitha jal. In areas of Rajasthan that are dry, such as Jodhpur, Jaisalmer, Barmer, Bikaner, Sri Ganganagar, and Hanumangarh, it can be found. Both conventional and contemporary medicine employs various parts of this plant. Fruits from *Salvadora persica* aid to eliminate "Tridosh" and function to cleanse blood by lowering the amount of "Pitta" that is present in the human body. Seed oil has anti-inflammatory and analgesic properties. The leaves also have anti-cancer qualities and are used for piles and intestinal problems. In the area of the body that is afflicted, heated leaves are bent. Camels consume the leaves. On blisters, the root bark is used. The leaves and fruits have an odd, spicy taste. In order to ascertain the Apoidean biodiversity on *Salvadora persica* L., a survey was carried out from the years 2018 to 2022 in eight chosen landscapes in four districts of western Rajasthan that are home to the Thar Desert. The collection of eight species of bees on its flowerings was the product of repeated collections over the course of five years (2018–2022). They have been determined to belong to the Megachile species of the genus Apis Linnaeus (04 sp.).

Keywords: apoidea, bees, pollination, cancer, western rajasthan

Introduction
Traditional remedies for rheumatism, leprosy, gonorrhoea, ulcers, scurvy, tumours, cancer, and dental problems include *Salvadora persica* (Linn.) (Miswak) (Almas K *et al.*, 1995; Jindal *et al*., 1996) [1, 28]. Salvadoricine, salvadourea, trimethyl amine, -sotisterol, di-benzyl thiourea, rutin, thioglucoside, chlorine, potash, sulphur, and other possible therapeutic chemicals are present in it (Malik *et al*., 1987; Gururaja G.R *et al*., 2004) [31, 25]. In addition to its therapeutic properties, it works well as a windbreak in agroforestry systems and aids in land reclamation (Bhatia B *et al*., 2000; Darmani H.T *et al*., 2006) [6, 9]. This tree produces sweet, palatable ripe fruits that are called "Piloo" locally and are eaten by rural and tribal people. When completely ripe, the former tastes sweet and is preferred by kids. The Salvadora plant produces a pale yellow solid fat from its seeds that is high in lauric and myristic acids and is used to make soap, illuminants, varnishes, paints, and other products for the food industry. It is acknowledged as a non-traditional oil seed crop. The bees that visit *Salvadora persica* (Linn.) in western Rajasthan are discussed in this research. The majority of pollination research in India has focused solely on honey bees and the cultivated plants they pollinate, whereas other bee species have received complete disregard. Few sources on the biology of pollination by bees other than Apis are available. The earlier works focused more on criticisms of the honey bees' inclusion on diverse crops (Burkill, 1906; Howard *et al*., 1920) [7, 27]. Similar research on the Apoidean Biodiversity in Western Rajasthan have been carried out by Charan *et al*., 2021 [4]; Kachhawa *et al*., 2020 [29]; Charan, 2004 [3]; Kachhawa *et al*., 2021 [30]; and Gupta *et al*., 2003 [23]. Mohammad (1935) [34] and Rahman (1940) [35] touching Sarson, Toria, and Cotton; Batra (1968 and 1977) [2], Mattu *et al*. (1989) [32], etc. on honey bee related features on diverse crops; and these are only a few notable studies that further detailed pollination aspect need to be addressed here. Dulta and Verma (1987) [10] provided a comparative analysis of several pollination-related factors of apple crop production. A total of 64 species of bees (Apoidea) were discovered on four farmed crops by Gupta and Yadav in 2001. They discussed agricultural rotation and numerous bee population dynamics features, although their research was only done in eastern Rajasthan and the neighbouring state of Uttar Pradesh. Free (1960, 1964, 1970, 1973, 1975 a&b, 1980, 1993, and 1998) made an excellent presentation on studies on pollination of roughly 70 crops. There are many more studies, including those by Free & Ferguson (1980), Free & Williams (1976 a&b), and Free *et al.* (1975) [19], which are just a few to mention here. The well-known book by McGregor (1976) is accessible online and is updated often. The pollination activities of leaf cutting bees and honey bees on beans (Viciafaba L.) were compared by Currie *et al*. in 1990, and Hogendoorn *et al.* (2010) [26] reported their findings for pollination research on tomatoes.

Material and methods
Study Site
The research location was in the western Rajasthan region of India, close to Jodhpur. Jodhpur is located at 2618.381 N Latitude and 7304.514 E Longitudes according to the GPS. Jodhpur experiences a severe sort of climatic climate, with very wide temperature swings. Jodhpur, Rajasthan has typical desert weather, which is hot and dry, with an annual rainfall average of only about 32 cm. The highest temperature in the summertime is around 42 C, while the lowest temperature is close to 37 C. The highest temperature throughout the winter is around 27.5C. Jodhpur experiences year-round sunshine and brightness. The investigation was carried out over a period of around five years (2018-2022). Frequent and recurring field surveys were carried out in several Jodhpur neighbourhoods from September 2018 to October 2022, along with sample collection. Bees were regularly collected from 06 carefully chosen farms and natural habitats in the Jodhpur district's Marwar Mathania, Osian, Tinwari, Manaklaoe, and Salawas villages. As the

collector made his way around the field, he swept an insect net across the blooms in search of bees. Every day of the field visit, bee samples were gathered from 8 or 9 AM until 5 or 6 PM. The initial author did, however, visit the site at sunrise and dusk to observe any extended bee activity. Benzene fumes in a death bottle were used to rapidly kill the collected bees. Before each one was recognised, they were transported to the lab, remoisten, and correctly dispersed.

Result and Discussion

The *Salvadora persica* (Linn.) tree is a medium-sized, heavily branched evergreen tree with branches that can stretch out or droop and are glabrous, terete, and more or less glaucous. This plant's two opposing branches grow symmetrically at a 45-degree angle to the primary axis. The size and shape of the leaves are opposite, deccustate, 3-6x2-4cm, elliptic-lanceolate or ovate. The 1-2 cm long petioles are joined by a line. In axillary and terminal, coumpound, loose penicles that are 5–15 cm long and have thin, opposing branches that culminate in tiny, sporadic flowers, the blooms are greenish-yellow in colour. Bracts below the pedicels are oblong and caduceus-shaped, and the pedicles are 1.5–3 mm long. Calyx less than 1mm long, glabrous, with a mid-down cleft and rounded lobes. Corolla, emphasised Ovary pedicelled minutely. A berry with a diameter of 6-7 mm that is gloosome Silky red when ripe, with a tenacious yellow calyx cup supporting it. 1st seed, subglobose, smooth, and brown, 4mm in diameter The *Salvadora persica*'s greenish-yellow blossom attracted a lot of pollinators, particularly honey bees. By 8:00 AM (IST), the pollinators began to arrive, and by 12:00 PM, their numbers were at their peak (IST). The following bee species were gathered on *Salvadora persica* (Linn.) during the designated collection periods: -

Table 1: List of Bee species found on *Salvadora persica* (Linn.) in the western Rajasthan

Insect Order	Name of Family	Name of Subfamily	Name of Tribe	Genus and Species	No. of Bees
Hymenoptera	Apidae	Apinae	Apini	*Apis cerana* Fabricius	82
Hymenoptera	Apidae	Apinae	Apini	*Apis dorsata* Fabricius	81
Hymenoptera	Apidae	Apinae	Apini	*Apis florea* Fabricius	90
Hymenoptera	Apidae	Apinae	Meliponini	*Trigona iridipennis* Smith	86
Hymenoptera	Megachilidae	Megachilinae	Megachilini	*Megachile cephalotes* Smith	6
Total					345

The composition of bee species on *Salvadora persica* (Linn.) in the western Rajasthan has not yet been the subject of any investigations. The current study is the first effort to investigate the pollinator bees on this crop in this region. The native Apoidean pollinators of this crop's pollination needs were urgently needed to be studied. During observations, seven kinds of bees were seen visiting trees that were in blossom. Apis florea Fabricius has the most bee visits, followed by *Trigona iridipennis* Smith, while *Megachile cephalotes* Smith has the fewest bee visitors overall.

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References

1. Almas K, AI-Lafi TR. The natural toothbrush, Med Aromat Planl Ab,1995:16(2):206-210.
2. Batra SWT. Crop pollination and the flower relationships of the wild bees of Ludhiana, India (Hymenoptera, Apoidea). Journal of the Kansas Entomological Society,1968:40:167-177.
3. Charan SK, Gupta RK, Naval RK, Rajpurohit A. Nesting biology of Megachile (Callomegachile) cephalotes smith, a solitary bee that nests in castor sticks (hymenoptera, megachilidae). Mellifera,2004:4(8).
4. Charan SK, Kachhawa G. Temporal Dynamics in the Species Composition, Diversity Entropy, and Foraging Activity of Butterflies (Insecta, Lepidoptera) in the Aravalli region of Jaipur, Rajasthan journal of Environment and Bio-Sciences,2021:35(2):207-212.
5. Batra SWT. Bees of India (Apoidea), their behaviour, management and a key to the genera. Oriental Insects,1977:11(3/4):289-324.
6. Bhatia B, Sharma HL. Fuelwood production and wasteland reclamation, Botanica,2000:14:84- 93.
7. Burkill IH. Notes on the pollination of flowers in India. Journal of the Asiatic Society of Bengal,1906:2:511-525.
8. Currie RW, Jay SC, Wright D. The effects of honey bees (*Apis mellifera* L.) and leafcutter bees (*Megachile rotundata* F.) on out crossing between different cultivars of beans (Vicia faba L.) in caged plots. Journal of Apicultural Research,1990:29(2):68-74.
9. Darmani HT, Nusayr AM, AL Hiyasat AS. Effects of extracts of miswak and derum on proliferation of Balb/C 3T3 fibroblasts and viability of carcinogenic bacteria, Int Dent Hygiene,2006:4:62-66.
10. Dulta PC, Verma LR. Role of insect pollinators on yield and quality of apple fruit. Indian Journal of Horticulture,1987:44(3/4):274-279.
11. Free JB, Ferguson AW. Foraging of bees on oilseed rape (*Brassica napus*) in relation to the stage of flowering of the crop and pest control. Journal of Agricultural Science,1980:94(1):151-154.
12. Free JB, Williams IH. Insect pollination of Anacardium occidentale L., Mangifera indica L., Blighia sapida Koenig and Persea americana Mill. Trop. Agric. Guilford,1976:53(2):125-139.
13. Free JB, Williams IH. Pollination as a factor limiting the yield of field beans (*Vicia faba* L.). Journal of Agricultural Science, Cambridge,1976:87(2):395-399.
14. Free JB, Ferguson A. W. Foraging of bees on oilseed rape (*Brassica napus*) in relation to the stage of flowering of the crop and pest control. Journal of Agricultural Science,1980:94(1):151-154.

15. Free JB. The pollination of fruit trees. Bee World 41, 1960, 141-151, 169-186.
16. Free JB. Comparison of the importance of insect and wind pollination of apple trees. Nature,1964:201:726-727.
17. Free JB. Insect pollinators of crops. Academic Press, London & New York, 1970, 544.
18. Free JB. Bees and other insect pollinators of crops. Apiacta,1973:8(1):19-27.
19. Free JB. Pollination of Capsicum frutescens, Capsicum annum and Solanum melongena in Jamaica. Trop. Agric. Guilford,1975:52(4):352-357.
20. Free JB. Observations on the pollination of papaya (Carica papaya L.) in Jamaica. Trop. Agric. Guilford,1975:52(3):275-279.
21. Free JB. Insect Pollination of Crops. Second Edition. Academic Press, San Diego, CA., 1993, 92101.
22. Free JB. Early man and the pollination of his food plants. Bee World,1998:79(3):147-148.
23. Gupta RK, Naval RK, Charan SK. Nesting biology of the solitary bee, megachile (pseudomegachile) creusa bingham (hymenoptera, megachilidae). Mellifera, 2003:3(5):43-50.
24. Gupta RK, Yadav S. Apoidean species composition on Crotalaria jucea L., Cajanus cajan (L.), Helianthus annus L. and Brassica compestris L. var. sarson Prain in eastern Rajasthan, India (Hymenoptera). Opus. zool. Flumin,2001:198:1-10.
25. Gururaja GR, Nayak AK, Chinchmalatpure AR, Nath A, Babu VP. Growth and Yield of Salvadora persica, A facultative halophyte grown on saline black soil (Vertic Haplustept), Arid Land Research and Management,2004:18(1):165-168.
26. Hogendoorn K, Bartholomaeus F, Keller MA. Chemical and sensory comparison of tomatoes pollinated by bees and by a pollination wand. Journal of Economic Entomology,2010:103(4):1286-1292.
27. Howard, A., G. L. C. Howard & A. R. Khan. Studies in the pollination of Indian crops. Memoires of Department of Agriculture, India (Botany Series),1920:10:195-220.
28. Jindal SK, Bhansali R, Satyavir R. Salvadora tree - A potential source of non-edible oil, In: Proc of All India seminar on rabi oil seed crop (Jodhpur, CAZRI), 1996.
29. Kachhawa G, Charan SK, Choudhary R. Diversity and pollination probability of insect pollinators of Tagetes erecta L. In the Chomu Tehsil, Rajasthan, India. International Journal of Entomology Research,2020:5(6):106-110.
30. Kachhawa G, Charan SK, Meena R. Natural insecticide plants: Tephrosoria Purpurea (L.) Pers and Trichodesma amplexicaule Roth in ecological relationship with hymenopteran pollinators in the Thar desert of Rajasthan, India. International Journal of Botany Studies,2021:6(3):761-766.
31. Malik S, Ahmed SS, Haider SI, Muzaffer A. Salvadoricine - a new indole alkaloid from the leaves of Salvadora persica, Tetrahedron Lett,1987:28:163-164.
32. Mattu VK, Mattu N, Verma LR, Lakhanpal TN. Pollen spectrum of honeys from Apis cerana colonies in Himachal Pradesh, India. In Proceedings of the Fourth International Conference on Apiculture in Tropical Climates, Cairo, Egypt, 1989, 146-153.
33. McGregor, S. E. Insect Pollination of Cultivated Crops.U. S. Dep. Agric. Washington, D. C. Handbook No. 496, 1976, 1-411.
34. Mohammad, A. Pollination studies in Toria (Brassica napus L. var. dichotoma Prain) and sarson (B. compestris var. sarson Prain). Indian J. Agric. Sci.5, 1935, 125-154.
35. Rahman KA. Insect pollinators of toria (Brassica napus Linn. var. dichtomaPrain), and sarson (Brassica campestris Linn. var.sarson Prain) at Lyallpur. Indian Journal of Agricultural Sciences,1940:10:422-447.