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The armored scales (Homoptera Diaspididae) of Algeria

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ABSTRACT Diaspididae (Hemiptera Coccomorpha) is one of the largest and most diverse family of scale insects and it contains many agricultural parasites worldwide. The study collected data from those previously reported in the literature over the period of 123 years. The inventory includes armored scales collected from field samples in several regions of Algeria as well as from a bibliographic survey. A critical review of the literature on armored scales in Algeria revealed the presence of 114 species, with mainly a palearctic distribution belonging to 48 genera distributed in four tribes. The Diaspidini tribe is the most abundant (50 species, 24 genera), followed by the Aspidiotini (47 species, 18 genera) and the Parlatorini (13 species, 4 genera) and finally the Odonaspidini (2 genera, 2 species). According to our survey, conducted between 1987 and 2020, 79 species were recorded, belonging to 37 genera distributed in four tribes. Compared to the Maghreb countries, Algeria has a significant coccidological richness in relation to the total number of species.

KEY WORDS Diaspididae; scale insects; inventory; Algeria.

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INTRODUCTION

Algeria enjoys an exceptional situation since it is the tenth largest country in the world (2.382 million km²) and the largest country on the African continent. It is bordered to the north by the Mediterranean Sea with 1200 km of coastline, to the east by Tunisia and Libya, to the south by Niger and Mali, to the southwest by Mauritania and Western Sahara, and to the west by Morocco. It lies between the parallels 18°58' and 37°05'N latitude and 08°40' W and 11°58' E. This geographical situation provides it with very special climatic and ecological diversity. Its vast territory grants it a diversification of its climate, landscapes, soils and natural vegetation (Letreuch-Belarouci, 1995). This ecoclimatic diversity offers an adaptability to thousands of species of fauna and flora and their populations.

Scale insects are one of the most serious pests in its range (Demirozer et al., 2009). Diaspididae (Hemiptera Coccomorpha) are the largest and most diverse family of scales, with more than 2,500 species described in 400 genera (García et al., 2016). They infest more than 1,380 host plant genera in 182 botanical families (Miller & Davidson, 2005). In Algeria, these armored scales throughout the northern band of Algeria (Biche, 2012) are the main cause of these infestations and the damages on the various hosts. Studies conducted so far on the ecology and biosystematics of Diaspididae remain few and far between. However, some earlier works on coccidological fauna were undertaken by several authors among which we quote the most important: Newstead (1897), Marchal (1909), Trabut (1911), Balachowsky (1926, 1927, 1928, 1929, 1930, 1932, 1933, 1939, 1948, 1949, 1950, 1951, 1953, 1954, 1956, 1958), Balachowsky & Mesnil (1935), Piguet (1960), Iperti et al. (1970), Benassy (1975), Doumandji (1984, 1985), Biche (1987; 2012), Saighi et al. (2005) and recently Taibi et al. (2016), Aroua et al. (2019, 2020), Zaabta et al., (2019), Boudjemaa et al. (2020) and Boukhobza et al. (2020).

In Algeria, with the advent of national and international trade, other species of diaspines have appeared and are currently causing significant damage to plants. Among these armoured scale insect, there are *Aonidiella aurantii, Chrysomphalus dictyospermi, Lepidosaphes beckii, Parlatoria ziziphi* and *Comstockaspis perniciosa*. Due to the lack of research on scale studies, we have undertaken extensive research into the inventory and the accurate recognition of the geographic and floristic distribution.

MATERIAL AND METHODS

Field survey and sampling

The survey was carried out in several study sites in Algeria (Fig. 1, Table 1), over a period of 33 years (1987–2020). We started out by going out into the field and selecting infested plants to take samples of infested plant organs. We put them in bags bearing labels indicating the place, date, host plants, and brought them to the laboratory for examination. The specimens were mounted on blade according to the method described in Balachowsky and Mesnil of 1935 and in Kosztarab & Kozàr (1988) observed by optical microscopy and identified by key in Balachowsky (1949a, b; 1950; 1951; 1953; 1954a, b; 1956) and (Miller & Davidson, 2005) The identification of the scale was done by one of us.

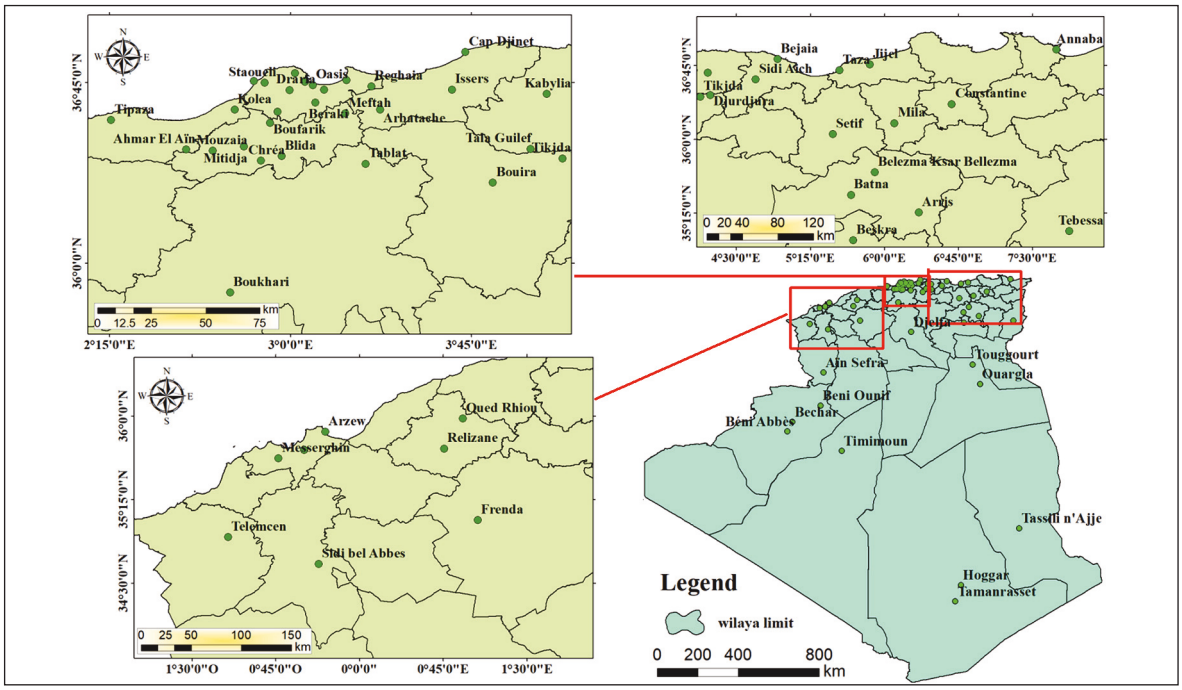

Figure 1. Location of study regions in Algeria.

	Collected		Bibliographic		
	Host plant	**Place**	**Sources**	**Host plant**	**Place**
ASPIDIOTINI					
Aonidia					
1. *A. lauri* (Bouche)	*Laurus nobilis*	4, 22	Balachowsky, 1927, 1932a	*Laurus nobilis*	3
			Saighi, et al., 2005	*Lagerstroemia indica nivea*	3
2. *A. mediterranea* (Lindinger)			Lindinger, 1910	*Callitris articulata, Juniperus communis*	4
Aonidiella					
3. *A. aurantii* (Maskell) *	*Citrus limetta, C. aurantium var. amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	4, 22	Balachowsky, 1950	*Citrus limetta, C. aurantium var. amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	55
			Saighi, et al., 2005	*Rosa major*	4
			Biche, 2012	*Citrus*	3
			Franco et al., 2006	*Citrus*	3
			Aroua et al., 2019	*C. clementina, C. sinensis*	4, 21
			Boudjemaa et al., 2020	*C. limon*	4
4. *A. taxus* Leonardi	*Podocarpus neriifolius, Taxus baccata.*	63	Balachowsky, 1927	*Taxus baccata*	21
			Saighi et al., 2005	*Podocarpus nereifolia*	4
Aspidaspis					
5. *A. longiloba* (Hall)	*Tamarix africana, T. gallica, Camellia* sp.	4	Belguendouz & Biche, 2015		3
Aspidiotus					
6. *A. nerii* Bouche*	*Phoenix dactylifera, Hedera helix, Arthrocnemum indicum, Laurus nobilis, Citrus limetta, C. aurantium var. amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica, Prunus spinosa, Morus nigra.*	7, 22, 28	Leonardi, 1920; Balachowsky, 1932a, 1950.	*Ceratonia siliqua, Sophora japonica, Morus pomifera*	28
	Albizia lebbek, Chamaerops humilis, Vitis vinifera.	7, 28	Delassus et al., 1927; Doumandji, 1985; Doumandji & Biche, 1986	*Citrus limetta, C. aurantium var. amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	22, 25, 30, 32, 64, 68
	Nerium sp., *Olea europaea, Smilax aspersa, Lavatera arborea, Calycotome spinosa, Pittosporum tobira, Crataegus oxyacantha.*	1, 4, 16, 23, 28, 45, 57, 64, 77.	Signoret, 1877	*Pistacia lentiscus*	
	Sambucus nigra, Euonymus japonicus, Fraxinus angustifolia var. excelsior,	4	Newstead, 1897		

	Olea europaea, Brachychiton populneus, Pistacia lenticularis, Acacia retinodes, Chamaerops humilis				
	Pistaciaa atlantica, Hedera helix, Sambucus nigra, Acacia retinodes, Gleditsia triacanthos var. *inermis, Lavatera arborea, Smilax aspera, Fraxinus angustifolia* var. *excelsior, Chamaerops humilis, Calycotome spinosa, Brachychiton populneus, Crataegus oxyacantha, Quercus* sp., *Olea europaea*	4, 45, 78	Saighi et al., 2005	*Dracaena dracon, Yucca aloifolia, Acocanthera spectablis, Nerium oleander, Howea belmoreana, Phoenix canariensis, Rhapis flabelliformis, Berberis pruinosa, B. sanguinea, Bignonia cherere, Lonicera caprifolia, Viburnum* sp., *V. lantana, V. tinus, Evonymus japonica, Encephalartos caffer, Diospyros duelonal, D. kaki, Arbutus unedo, Aleurites palmatae, Ceratonia siliqua, Erythrina herbacea, Robinia pseudacacia, Shotia latifolia, Rosmarinus officinalis, Tetranthera* sp., *Asparagus falcatus, Strelitzia augusta, Fraxinus* sp., *Jasminum primulinum, Ligustrum vulgare, Olea europea, Pittosporum heterophyllum, P. tobira, P. undulatum, Grevillea robusta, Macadamia ternifolia, Prunus* sp., *P. laurocerasus, Datura arborea, Luhaea divaricata, Alpinia nutans*	3
Chrysomphalus					
7. *C. aonidum* (Linnaeus) *	*Ficus retusa* var. *alba, F. carica, F. macrophylla, F. elastica, F. capensis, F. rubiginosa,F. indica, F. nitida, Fraxinus angustifolia* var. *excelsior, Citrus sinensis*	4, 19, 22, 47	Balachowsky, 1927, 1928a, 1932a, 1950	*Bupleurum lateriflorum, Cocos plumosa, Howea selloniana, Phoenix canariensis, Aralia papyrifera, Meryta denhamii, Nerium* sp., *Carissa bispinosa, Acer* sp., *Acer negundo, Begonia* sp., *Opuntia tomentosa, Euonymus japonicus, Ricinus communis, Brexia* sp., *Laurus nobilis, Persea gratissima, Musa* sp., *Strelitzia augusta, Eucalyptus* sp., *Psidium guajava, Ficus elastica, Panicum parlatorei, Citrus aurantium.* var. *amara, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica,C. bigaradia, Eriobotrya japonica, Prunus laurocerasus, Rhamnus alaternus, Camellia* sp., *Magnolia grandiflora, Ficus retusa, Morus nigra, M. pomifera*	4
			Aroua et al., 2019	*C. clementina, C. sinensis*	

8. *C. dictyospermi* (Morgan) *	*Ficus retusa* var. *alba, F. carica, F. macrophylla, F. elastica, F. capensis, F. rubiginosa, F. indica, F. nitida, Olea europaea*	4, 48	Balachowsky, 1927, 1932a, 1950	*Monstera deliciosa, Cocos romanzoffiana, Howea selloniana, Phoenix canariensis, Pritchardia filifera, Lithraea aroeira, Pistacia lenticularis, Buxus sempervirens, B. balearica, Euonymus europaeus, Cyperus alternifolius, Arbutus unedo, Acacia cyanaphylla, Cercis siliquastrum, Ceratonia siliqua, Sophora davididae, Quercus lusitanic, Ophiopogon japonicus, Ruscus aculeatus, R. hypoglossum, Ficus retusa* var. *alba, F. carica, F. macrophylla, F. elastica, F. capensis, F. rubiginosa, F. indica, F. nitida, F.heterophylus, Olea europaea, Yucca elephantipes, Strelitzia augusta, S. reginae, Eugenia jambo, Chamaerops humilis, Gigantochloa asersa, Pittosporum tobira, Platanus orientalis, Eriobotrya japonica, Prunus laurocerasus, Pyrus communis, Platanus reclinata, Bonksia* sp., *Punica granatum, Brachychiton populneus, Populus alba, P. nigra, Cotoneaster* sp.	
			Saighi et al., 2005	*Chorisia speciosa, Cupressus sempervirens, Ficus elastica, F. retusa, Eucalyptus botryoides, Platanus orientalis, Brachychiton acerifolium, Sterculia platanifolia,*	4
			Biche, 2012; Franco et al., 2006	*Citrus*	3
			Aroua et al., 2019	*C. clementina, C. sinensis*	4, 21
9. *C. pinnulifer* (Maskell)			Balachowsky, 1932a	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	
Clavaspis					
10. *C. herculeana* (Cockerell & Hadden)	*Bauhinia purpirae*	4	Saighi et al., 2005	*Tithonia tagetiflora, Aleurites palmatae, Bauhinia aculeata, B. purpurea, Gleditschia triacanthos.*	4
Comstockaspis					
11. *C. perniciosa* (Comstock) *	*Carya porcina, Pterocarua fraxinifolia, Cydonia* sp., *Malus communis, Prunus pissardi*	4, 21, 22, 45, 78, 81	Borchsenius, 1966	*Malus communis*	22, 45, 50
			Cabi, 1986		3
Cryptoparlatoreopsis					
12. *C. meccae* (Hall)			Balachowsky, 1951	*Ziziphus* sp.	18
13. *C. tlaiae* (Balachowsky)			Balachowsky, 1927	*Tamarix aphylla*	3

			Balachowsky, 1951	*Tamarix* sp.	17
Diaspidiotus					
14. *D. armenicus* (Borchsenius)	*Tamarix* sp.	70	Belguendouz & Biche, 2015		3
15. *D. braunschvigi (*Rungs*)*	*Pistaciaa atlantica*	30	Belguendouz & Biche, 2015		3
16. *D. cecconii* (Leonardi)	*Anabasis oropediorum*	54	Borchsenius, 1966; Marchal, 1909; Sanders, 1909; Balachowsky, 1927, 1932a	*Sedum album, Moricandia arvensis, Ephedra* sp., *Ephedra altissima, Asparagus* sp.	57
			Bodenheimer, 1937 et 1943	*Ephedra* sp.	
17. *D. distinctus* (Leonardi)			Balachowsky, 1932a	*Quercus lusitanica*	4
18. *D. forbesi* (Johnson)	*Tamarix* sp.	70	Belguendouz & Biche, 2015		3
19. *D. gigas* (Thiem & Gerneck)			Balachowsky, 1950	*Myrtus alba, M. nevelii, Ficus retusa* var. *alba, Solanum sodomaeum, Populus nigra, Salix alba, S. pedicellata, Tilia parvifolia*	21
20. *D. labiatarum* (Marchal)			Balachowsky, 1929a, 1932a, 1934; Kaussari, 1955	*Teucrium capitatum*	
21. *D. laperrinei* (Balachowsky)	*Nerium* sp., *Tamarix africana, T. gallica, T. aphylla*		Balachowsky, 1929a, 1932d, 1934; Kaussari, 1955	*Nerium* sp., *Myrtus nevelii, Olea lapperrinei, Olea europaea*	29, 40
22. *D. lenticularis* (Lindinger)	*Pistacia lenticularis, Fraxinus angustifolia* var. *excelsior, Prunus avium, Rhamnus alaternus, R. alaternus*	4, 50, 60.	Belguendouz & Biche, 2015		3
	Olea europaea	23, 26, 56, 59,			
23. *D. lepineyi* (Balachowsky)	*Chamaerops* sp., *C. humilis, Prunus domestica*	4	Belguendouz & Biche, 2015		3
24. *D. maleti* (Vayssière)	*Fraxinus angustifolia* var. *excelsior, Olea europaea*	8, 14, 26, 44, 50, 61, 64, 81	Balachowsky, 1927, 1932a	*Olea europaea*	4
25. *D. nitrariae* (Marchal)			Marchal, 1911; Balachowsky, 1930 a, 1932a	*Nitraria sp*	4
26. *D. ostreaeformis* (Curtis)	*Quercus ilex, Fraxinus angustifolia* var. *excelsior*	4, 76	Balachowsky, 1928b, 1932a		3
27. *D. pyri* (Lichtenstein)	*Chamaerops* sp., *Olea europaea, Platanus orientalis, Prunus dulcis*	26, 59, 64	Balachowsky, 1928b, 1932a, 1948		4
28. *D. wuenni* (Lindinger)	*Ilex aquitifolius*	70	Belguendouz & Biche, 2015		3
29. *D. zonatus* (Frauenfeld)	*Ficus carica*	4, 30, 46, 79	Belguendouz & Biche, 2015		3

Dynaspidiotus					
30. *D. abietis* (Schrank)			Balachowsky, 1928b, 1932a	*Pinus halepensis, Quercus pubescens, Ficus carica, Platanus orientalis*	
31. *D. britannicus* (Newstead)			Balachowsky, 1928b, 1932a, 1950	*Ilex aquitifolius, Buxus sempervirens, B.balearica, Pinus halepensis,*	4
32. *D. ephedrarum* (Lindinger)			Balachowsky, 1930a, 1950	*Ephedra* sp., *Ephedra nebrodensis, Cedrus* sp., *Pinus sylvestris*	27
33. *D. regnieri* (Balachowsky)	*Fraxinus communis, Cedrus atlantica*	16, 64, 76	Balachowsky, 1950, 1954a	*Cedrus* sp.	27
Gonaspidiotus					
34. *G. minimus* (Leonardi)		16, 52, 79, 81	Balachowsky 1928b, 1932a, 1932b		4
35. *G. seurati* (Marchal)			Marchal, 1911	*Acanthorrhinum ramosissimum*	3
			Balachowsky 1934,1956	*Trichodesma africanum*	3
Hemiberlesia					
36. *H. lataniae* (Signoret) *	*Olea europaea, Calycotome spinosa*	26, 44	Balachowsky, 1927, 1932a, 1950	*Chrysanthemum segetum, Beta maritima, Eriodendron sp, Ficus heterophylus, F. indica, Inula viscosa, Strelitzia reginae, Opuntia tomentosa, Solanum sodomaeum, Vitis vinifera*	4
	Nerium sp, Olea europaea, Eriobotrya japonica, Prunus amygdalus	57	Saighi *et al*., 2005	*Aralia* sp., *Hedera helix algeriensis, Meryta denhamii, Corypha australis, Catalpa fargesii, Chorisia speciosa, Buddleia davidii, Buxus balearica, B. japonica, B. sempervirens, Eleadendron capense, Cyperus* sp., *Erica arborea, Aleurites palmatae, Bauhinia purpurea, Cercis siliquastrum* var. *alba, Aberia caffra, Ginkgo biloba, Rosmarinus officinalis, Persea americana, Magnolia grandiflora* var. *exoniensis, Cocculus laurifolius, Ficus retusa, Morus rubra, Strelitzia augusta, S. nicolai, Theophrasta* sp., *Eugenia uniflora, Feijoa sellowiana, Fraxinus angustifolia, Phytolacca decandra, Macadamia ternifolia, Hovenia dulcis, Crataegus oxyacantha, Prunus laurocerasus, Citrus aurantium var.amara, Populus alba, Brachychiton populneum, Sterculia platanifolia, Taxus baccata, Tilia euculana, Ulmus campestris, Vitis* sp., *V. berlandieri, V. riparia, V. rupestris*	4
	Prunus dulcis, Fraxinus angustifolia var. *excelsior*	45			
	Bauhinia grandiflora, Euonymus japonicus, Hypericum canariensis, Ficus rubiginosa, Chamaerops humilis, Calycotome spinosa, Sterculia platanifolia	4, 39			

37. *H. rapax* (Comstock) *	*Chamaerops humilis, Hedera* sp., *Cercis siliquastrum, Fraxinus* sp., *Olea europaea, Platanus orientalis, Rubus* sp.	4, 44, 57	Newstead, 1897; Balachowsky, 1927; 1932a, 1950	*Hedera helix, Inula viscosa, Elaeagnus reflexa, Laurus nobilis, Theophrasta* sp., *Myrtus alba, Morus alba, Fraxinus oxyphylla, Phytolacca dioica, Platanus orientalis, Populus alba, Ruta angustifolia*	4, 7, 65
			Saighi et al., 2005	*Corypha australis, Platanus orientalis*	4
Morganella					
38. *M. longispina* (Morgan)	*Fraxinus communis*	4	Balachowsky, 1926, 1927, 1950; Ferris, 1938	*Ficus carica, Fraxinus communis, Olea europaea*	4
			Saighi et al., 2005	*Corylus avellana, Catalpa fargesii, Cordia myxa, C. nodosa, Buddleia davidii, Aleurites mollucana, A. palmatae, Acacia arabica, A. floribunda, Bauhinia purpurea, B. racemosa, Ceratonia siliqua, Gleditschia sinensis, G.triacanthos var. inermis,Castanea sativa, Aesculus californica, Lagunaria patersonii, Ficus* sp., *F. carica, F. elastica, F macrophylla, Morus nigra, Morus pomifera, Musa* sp., *Fraxinus* sp., *F. angustifolia, Ligustrum japonicum, Olea europea,Palliurus australis, Prunus* sp., *Populus nigra, Salix alba, Cestrum foetidissimum, C. futibum, C. nocturnum, Iochromaa tubulosa, Luhaea divaricata*	4
39. *M. claviformis* Balachowsky et Richardeau			Balachowsky, 1951; Balachowsky & Richardeau, 1942	*Tamarix gallica*	82, 58
40. *M. megapora* (Balachowsky)			Balachowsky, 1951	*Tamarix aphylla*	82
Oceanaspidiotus					
41. *O. spinosus* (Comstock) *	*Meryta denhamii, Nerium* sp., *Euonymus japonicus, Olea europaea, Pittosporum tobira, Platanus* sp., *Brachychiton populneus, Crataegus* sp., *Crataegus oxydentalis, Rhamnus alaternus*	4, 26, 57, 21	Balachowsky, 1932a; Ferris, 1938		
			Balachowsky, 1948; 1950	*Euonymus japonicus, Nephelium longana*	
	Phoenix reclinata, Euonymus japonicus, Olea europaea, Populus alba	4	Saighi et al., 2005	*Acer* sp., *A. negundo, Dracaena draco, Chamaerops humilis, Bauhinia racemosa, Cercis siliquastrum, Robinia pseudacacia, Castanea sativa, Carya porcina, Pterocarya fraxinifolia, Rosmarinus officinalis, Persea indica, Morus nigra, M. pomifera, Musa* sp., *Fraxinus excelsior,*	4

				Ziziphus sp., *Crataegus oxyacantha, Cydonia vulgaris, Eriobotrya japonica, Prunus* sp., *Nephelium longana, Sterculia macrocarpa, Celtis australis, C. occidentalis, Ulmus campestris*	
Rhizaspidiotus					
42. *R. donacis* (Leonardi)			Balachowsky, 1928c, 1932a; Ferris, 1943	*Arundo donax, Phragmites australis*	4
Rungaspis					
43. *R. capparidis* (Bodenheimer)	*Pistacia atlantica, Atriplex halimus, Halocnemum strobilaceum*	30, 57	Balachowsky, 1949a, 1951	*Convolvulus trabutianus, Calligonum comosum*	62
Saharaspis					
44. *S. ceardi* (Balachowsky)	*Pistacia atlantica, P. lenticularis.*	23, 26, 76	Balachowsky, 1932a; Balachowsky & Mesnil, 1935; Rungs, 1935.	*Ficus carica, Vitis vinifera*	2, 13, 17 28, 77, 82
	Ficus carica, Olea europaea, Vitis vinifera	4, 20, 30, 44, 50, 54, 57, 59			
Targionia					
45. *T. halophila* (Balachowsky)	*Platanus orientalis*	4	Balachowsky, 1932a; Ferris, 1943	*Halocnemum strobilaceum*	28
46. *T. nigra* Signore*t*	*Debregeasia longifolia*	54	Balachowsky, 1932a; Ferris, 1943	*Helichrysum angustifolium, Senecio cineraria, Suaeda vermiculata, Arundo donax, Retama raetam, Debregeasia longifolia*	56
47. *T. vitis* (Signoret)	*Atriplex halimus*	10	Leonardi 1900; Trabut, 1911; Balachowsky, 1927; Ferris, 1943	*Arbutus* sp., *Quercus ilex, Oplismenus compositus.*	28, 51
DIASPIDINI					
Acanthomytilus					
48. *A. intermittens* (Hall)			Balachowsky, 1954b	*Panicum sp*	72
Andaspis					
49. *A. hawaiiensis* (Maskell)	*Acacia farnesiana, Acacia arabica, Sophora davididae, Olea europaea*	4	Balachowsky, 1928b	*Albizia* sp., *Mimosa* sp.	
			Balachowsky, 1954b	*Cassia* sp.,*Cedrus atlantica, Albizzia lebbek, Erythrina* sp., *Mimosa* sp.	4
			Saighi et al., 2005	*Buddleia davidii, Acacia floribunda, Albizzia lophantae, Cassia tora, Gleditschia triacanthos* var. *inermis, Lagerstroemia indica nivea, Hibiscus elatus, Lagunaria patersonii, Lavatera olbia, Fraxinus angustifolia, F. excelsior, Salix pubescens, Harpullia* sp., *Kobrenteria paniculata, Spindus utilis*	4

Aulacaspis					
50. *A. herbae* (Green)			Bodenheimer, 1924, 1937	*Bambusa* sp., *Erythrina* sp., *Phragmites communis*	
			Green, 1899	*Oplismenus compositus, Panicum parlatorei*	
51. *A. rosae* (Bouché) *	*Rubus ulmifolius*	4, 28, 45	Trabut, 1911	*Laurus nobilis*	4
			Balachowsky, 1954b	*Rubus* sp.	
Carulaspis					
52. *C. atlantica* (Lindinger)	*Cupressus sempervirens, Cupressus lusitanica, Juniperus communis, Juniperus phoenicea, Taxus baccata*	4, 28, 59	Belguendouz & Biche, 2015		3
53. *C. juniperi* (Bouché) *	*Cedrus atlantica, C.libanotica*	31	Danzig & Pellizzari, 1998	*Albizia leb*	3
	Cedrus sp.	73	Miller and Davidson, 2005		3
54. *C. minima* (Signoret) *	*Cupressus sempervirens, Biota orientalis*	4	Balachowsky 1926, 1954b		4
			Rosen & DeBach, 1978		3
			Miller & Davidson, 2005		3
55. *C. taxicola* (Vayssière)	*Taxus baccata*	21	Vayssière, 1913	*Taxus baccata*	
56. *C. visci* (Schrank)	*Juniperus phoenicea, Taxus baccata*	14, 79	Balchowsky, 1954b	*Juniperus oxycedrus, Viscum* sp., *Pinus* sp., *Taxus* sp.	4, 9, 31
	Cupressus sempervirens	4			
Chionaspis					
57. *C. etrusca* Leonardi	*Tamarix africana, T. gallica, T.* sp.	30, 57	Balachowsky, 1954b	*Tamarix* sp.	
	Tamarix africana, T. gallica	42, 57	Danzig & Pellizzari, 1998	*Quercus sp, Tamarix africana, Myricaria* sp., *Tilia* sp.	4
58. *C. kabyliensis* Balachowsky	*Pinus pinea*	73	Balachowsky, 1930 a, 1954a,b	*Cedrus* sp., *Cedrus atlantica, Pinus pinea, P. sylvestris*	11, 76
	Cedrus sp.	30			
59. *C. platani* (Cooley)	*Tamarix* sp.	4	Belguendouz & Biche, 2015		3
60. *C. salicis* (Linnaeus)	*Salix pubescens*	27	Balachowsky 1954b	*Salix pubescens*	27, 53, 81
	Populus alba	4	Danzig & Pellizzari, 1998		4
Contigaspis					
61. *C. bilobis* (Newstead)	*Calycotome spinosa*	20, 54	Newstead, 1895		3
			Balachowsky, 1954b	*Foeniculum vulgare, Calycotome spinosa*	4, 20, 72
			Balachowsky 1926	*Globularia alypum*	4
62. *C. farsetiae* (Hall)			Danzig & Pellizzari, 1998		3
Diaspis					
63. *D. asparagi* Giard			Giard, 1893	*Asparagus horridus*	
64. *D. boisduvalii* Signoret*	*Phoenix dactylifera*	4	Lepiney & Mimeur, 1931	*Phoenix canariensis*	
			Balachowsky 1929b, 1954b	*Cocos plumosa, Cocos weddelliana*	55
			Saighi, et al., 2005	*Phoenix dactylifera*	4

65. *D. coccois* Lichtenstein	*Cocos romanzoffiana*	4	Balachowsky, 1954b	*Cocos romanzoffiana, Cocos nucifera*	4
66. *D. echinocacti* (Bouché) *	*Ficus indica*	5	Newstead, 1901	*Opuntia elongate*	3
			Saighi et al., 2005	*Opuntia ficus-indica*	4
67. *D. radicicola* Ferris			Balachowsky 1927, 1954b; Nakahara, 1982	*Opuntia tomentosa*	4
Discodiaspis					
68. *D. numidica* (Balachowsky)	*Helianthemum virgatum*	57	Balachowsky, 1949b	*Helianthemum virgatum, Helianthemum pilosum*	57
69. *D. salicorniae* (Gómez-Menor Ortega)	*Atriplex campestris, Salsola strobilaceum, Salsola vermiculata* var. *pubescens, Salicornia* sp., *Holocnemum strabilaceum*	57	Belguendouz & Biche, 2015		3
Duplachionaspis					
70. *D. berlesii* (Leonardi)	*Pistacia lentiscus, Asparagus acutifolia, Pittosporum* sp.	4	Leonardi, 1920		
			Balachowsky, 1954b	*Pistacia lentiscus, Asparagus* sp.	4, 21, 66
71. *D. divergens* (Green)			Trabut, 1910; Hall, 1923	*Arundo donax*	
72. *D. monodi* (Rungs)			Balachowsky, 1954b	*Panicum* sp.	71, 72
73. *D. natalensis* (Maskell) *			Rungs, 1942	*Panicum parlatorei*	
74. *D. noaeae* (Hall)			Balachowsky, 1933, 1954b	*Arthrocnemun glaucum, Arthrocnemum indicum, Salicornia fruticosa, S.* sp.	55
75. *D. sicula* (Lupo)			Balachowsky, 1954b	*Aphyllanthes monspessulanus, Lygeum spartum*	3
Epidiaspis					
76. *E. leperii* (Signoret)	*Olea europaea, Prunus persica*	4, 43	Balachowsky, 1954a	*Malus* sp., *Prunus* sp., *Pyrus communis, Mespilus germanica*	43, 11
			Trabut, 1911		
			Miller & Davidson, 2005		
Fiorinia					
77. *F. fioriniae* (Targioni Tozzetti) *	*Chamaerops humilis*	68	Mamet, 1943	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C.reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	
	Bupleurum spinosum, Phoenix canariensis, Buxus balearica, Laurus nobilis, Musa sp.	4	Balachowsky, 1954b	*Howea* sp., *Phoenix* sp., *Pistacia* sp., *Buxus* sp., *Laurus* sp., *Eucalyptus* sp., *Chamaerops* sp., *Tilia* sp.,	
			Saighi et al., 2005	*Chamaerops humilis, Phoenix canariensis, Laurus nobilis, Musa* sp., *Strelitzia nicolai*	4
Froggattiella					
78. *F. penicillata* (Green)			Balachowsky, 1953; Takagi, 1969	*Bambusa* sp.	
			Saighi et al., 2005	*Arundo donax, Bambusa vulgaris*	4
Furchadaspis					
79. *F. zamiae* (Morgan) *	*Cycas revoluta, Encephalartos caffer*	4	Balachowsky, 1954b	*Cussonia spicata, Cycas revoluta, Ceratozamia mexicana*	4

			Saighi et al., 2005	*Cycas revoluta, Encephalartos caffer*	4
Getulaspis					
80. *G. bupleuri* (Marchal)	*Olea europaea*	23, 49	Marchal, 1904	*Bupleurum gibraltaricum*	
			Balachowsky, 1954b	*Bupleurum gibraltaricum, Bupleurum lateriflorum, Bupleurum spinosum, Olea europaea*	28
Kuwanaspis					
81. *K. bambusicola* (Cockerell)			Cockerel, 1902	*Bambusa bambos, Bambusa spinosa*	
			Balachowsky, 1927, 1954b	*Aralia papyrifera, Asparagus falcatus, Asparagus horridus*	4
			Saighi et al., 2005	*Bambusa vulgaris*	4
82. *K. pseudoleucaspis* (Kuwana) *	*Bambusa macroculmis, Eragrostis* sp., *Arundinaria* sp., *Phyllostachys* sp.	4	Balachowsky, 1954b	*Tetranthera* sp.	4
Lepidosaphes					
83. *L. beckii* (Newman) *	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*		Balachowsky, 1930b, 1954b	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	51
			Franco et al., 2006	*Citrus* ?	3
			Saighi et al., 2005	*Buddleia davidii, Murraya exotica, Citrus aurantium* var. *amara*	4
			Biche, 2012	*Citrus*	3
			Zaabta et al., 2020; Boukhobza et al., 2020	*C. sinensis*	4
84. *L. conchiformis* (Gmelin) *	*Tilia parvifolia*	42, 57	Newstead, 1897; Balachowsky, 1954b		3
	Bauhinia racemosa	4, 28, 57	Saighi et al., 2005	*Ficus carcia*	4
	Olea europaea	26			
	Cupressus sempervirens	59			
85. *L. flava* (Signoret)	*Olea europaea*	4, 14, 21, 23, 26, 44, 45, 54, 57, 59, 61, 64, 81	Bodenheimer, 1924	*Olea europaea*	
			Balachowsky, 1954b; Benassy, 1986; Biche et Bourahla, 1991	*Phillyrea media, Olea europaea*	55, 79, 24
			Pellizzari & Fontana, 1996	*Olea europaea*	
86. *L. gloverii* (Packard) *	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia,*	51, 21, 57	Piguet, 1960	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	51

	C. japonica		Danzig & Pellizzari, 1998; Tena & Garcia Mari, 2011; Biche, 2012	*Citrus*	3
			Saighi et al., 2005	*Citrus aurantium* var. *amara,*	4
87. *L. granati* Koroneos	*Crataegus oxyacantha,*	16	Balachowsky, 195b	*Crateagus* sp.	27, 76
	Pinus maritime		Danzig, 1972	*Brexia* sp.	
88. *L. ulmi* (Linnaeus) *	*Biota orientalis, Citrus aurantiu.* var. *amara*	45	Balachowsky, 1954	*Pinus* sp.	55
	Elaeagnus angustifolia, Pinus maritime, Ulmus rosae	4	Merrill, 1953		
Lineaspis					
89. *L. striata* (Newstead)	*Taxus baccata*	76	Balachowsky, 1954b	*Cupressus* sp., *Cupressus lusitanica, Callitris quadrivalvis, Juniperus oxycedrus, Taxus baccata*	4, 7, 28, 11, 36, 43, 78,
	Juniperus phoenicea	75			
			Newstead, 1897		
Mohelnaspis					
90. *M. ampelodesmae* (Newstead)	*Ampelodesma tenax*	28	Newstead, 1897	*Ampelodesma tenax*	3
Pinnaspis					
91. *P. aspidistrae aspidistrae* (Signoret)*			Balachowsky, 1954b	*Ophiopogon japonicus*	4
Salicicola					
92. *S. vayssierei* (Balachowsky)			Balachowsky, 1958b	*Rhus pentaphylla*	
			Rungs, 1942	*Rhus tripartitum*	
			Lepiney & Mimeur, 1931	*Argania sideroxylon*	
Thysanofiorinia					
93. *T. nephelii* (Maskell)			Marchal, 1906; Balachowsky, 1954b; Takagi, 1970; Danzig & Pellizzari, 1998	*Nephelium longana*	4
Unachionaspis					
94. *U. bambusae* (Cockerell)			Balachowsky, 1927	*Bambusa* sp.	
Unaspis					
95. *U. citri* (Comstock)			Trabut, 1910; Borchsenius, 1966	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	3
96. *U. euonymi* (Comstock) *			Nakahara, 1982	*Euonymus japonicus*	
			Lepiney & Mimeur, 1931	*Euonymus europaeus*	
			Borchsenius, 1966	*Lonicera* sp., *Syringa* sp., *Fraxinus berlandieri, Ligustrum vulgare, Olea europaea*	
Voraspis					
97. *V. Ceratoniae* (Marchal)	*Ceratonia siliqua*	4, 57	Marchal, 1904		
			Balachowsky, 1954b	*Ceratonia siliqua*	3, 28
98. *V. nerii* (Newstead)	*Nerium* sp.	20, 28	Newstead, 1895; Lindinger,1910		

	Nerium sp., *Laurus nobilis*	4, 57, 20	Balachowsky, 1954b	*Beta maritima*	20, 28
PARLATORINI					
Cryptoparlatoreopsis					
99. *C. tlaiae* (Balachowsky)			Balachowsky, 1927	*Tamarix aphylla*	3
Parlatoreopsis					
100. *P. longispina* (Newstead)	*Ficus macrophylla, Persea gratissima, Tetranthera* sp.	4	Doumandji, 1984	*Persea gratissima, Viscum* sp., *Asparagus* sp., *Ophiopogon japonicus*	4
101. *P. pyri* (Marlatt)	*Ficus retusa* var. *alba*	35, 41, 47, 38	Doumandji, 1984		4
Parlatoria					
102. *P. blanchardi* (Targioni Tozzetti)	*Ficus retusa* var. *alba, Ficus elastic*	20	Targioni, 1892; Palmer, 1905; Balachowsky, 1953; Carpenter et al., 1978	*Howea belmoreana*	13, 20, 58
			Miller & Davidson, 2005		
103. *P. camelliae* Comstock	*Euonymus japonicus*	39	Saighi et al., 2005	*Evonymus japonica, Citrus aurantium* var. *amara*	4
104. *P. fluggeae* Hall	*Sambucus nigra, Euonymus* sp.	4	Balachowsky, 1953	*Oplismenus compositus*	
			Danzig & Pellizzari, 1998		
			Saighi et al., 2005	*Erythrina herbacea, Robinia pseudocacia, Logunaria patersonii, Salix pubescens, Cestrum foetidissimum, C. nocturnum, Luhaea divaricata, Debregeasia longifolia*	4
105. *P. oleae* (Colvée) *	*Olea europaea*	57, 64, 65, 70, 78	Newstead, 1897; Balachowsky, 1953		4, 57
	Prunus sp., *Rubus ulmifolius*	26, 44, 45, 50, 59, 61	Trabut, 1911		
	Pittosporum heterophyllum, Pyrus communis, Prunus aspersa	21, 26	Biche, 1987	*Olea europaea*	26
	Photinia Japonica	12			
	Prunus cerasus, Rhaphiolepis indica	21, 80; 81			
	Euonymus japonicus, Fraxinus sp., *Cotoneaster pannosa, Eriobotrya japonica, Prunus armeniaca, Mespilus germanica*	74			
	Ficus retusa var. *alba*	4			
	Eucalyptus botryoides	7			
	Pistacia sp., *Schinus terebinthifolius, Calicotome spinosa, Fraxinus ornus, Pinus nigra*	76			

	Prunus sp.	59			
106. *P. pergandii* Comstock*	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. myrtifolia, C. japonica*	7, 28, 42, 51, 52, 57, 63, 61, 67, 81,	Balachowsky, 1953	*Euonymus japonicus*	
			Newstead, 1897; Piguet, 1960; Benassy, 1975	*Bupleurum spinosum, Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi,*	51
				C. medica, C. triptera, C. myrtifolia, C. japonica	
			Biche, 2012	*Citrus*	3
			Aroua et al., 2019	*C. clementina, C. sinensis*	4, 21
107. *P. theae* Cockerell *	*Euonymus* sp., *Viburnus* sp.	4	Belguendouz & Biche, 2015		3
108. *P. ziziphi* (Lucas) *	*Citrus limetta, C. aurantium* var. *amara, C. clementina, C. sinensis, C. limon, C. reticulata, C. paradisi, C. medica, C. triptera, C. nobilis, C. myrthifolia, C. japonica, C. bigaradia*	55	Boisduval, 1867; Piguet 1960		
			Benassy, 1975	*Citrus*	
			Boisduval, 1867		
			Saighi et al., 2005	*Citrus* sp., *C. aurantium* var. *amara, C. limetta*	4
			Belguendouz et al., 2009; Belguendouz et al., 2011; Biche, 2012; Belguendouz, 2014	*Citrus ssp*	51
			Franco et al., 2006	*Citrus*	3
			Taibi et al., 2016	*Citrus*	81
			Takarli et al., 2015	*C. clementina,*	51
			Aroua et al., 2019; Aroua et al., 2020	*C. clementina, C. sinensis*	4
Leucaspis					
109. *L. pini* (Hartig)	*Cedrus atlantica*	4, 16, 22, 27, 31, 76,	Saighi et al., 2005	*Pinus halepensis, P. longifolia, P. pinea*	4
	Pinus nigra	22, 34, 57, 79	Belguendouz & Biche, 2015		3
	Pinus sp., *Pinus halepensis*	12, 16, 30			
110. *L. pusilla* Löw			Saighi et al., 2005	*Pinus halepensis, P. longifolia, P. pinea*	4
111 *L. riccae* Targioni-Tozzetti	*Ephedra alata, Ephedra corsoniana*	4	Marchal, 1909	*Ephedra*	
			Balachowsky, 1953		57

112. *L. signoreti* (Signoret)	*Pinus nigra*	76, 14	Balachowsky, 1928b		
			Balachowsky, 1953	*Cedrus* sp., *Cedrus atlantica*	31
ODONASPIDINI					
Froggattiella					
113. *F. penicillata* (Green)	*Bambusa macroculmus*	4	Balachowsky, 1953	*Bambusa* sp.	4
			Takagi, 1969		
			Saighi et al., 2005	*Arundo donax, Bambusa vulgaris*	4
Odonaspis					
114. *O. secreta* (Cockerell)			Lindinger, 1912; Borchenius, 1937; Balachowsky, 1953; Takagi, 1970	*Bambusa* sp.	4

Table 1. Armored scales species of Algeria.

Data Analysis

The listed species, are grouped by separate tribe by region and host plant, with corresponding references for each species.

RESULTS AND DISCUSSION

Bibliographic inventory of Algerian citrus scales

In light of the results, we list the Diaspididae which now has 114 species belonging to 48 genera in four tribes; 27 of them are considered cosmopolitan species. The host plants of the Diaspididae reach 488 plant species belonging to 94 botanical families. Although these species have primarily a palearctic distribution, the Diaspidini tribe is the most abundant with 50 species in 24 genera, followed by the Aspidiotini with 47 species in 18 genera with, the Parlatorini with 13 species in 4 genera the Odonaspidini is the least represented with 2 genera and 2 species. The two species *Froggattiella penicillata* (Green) and *Odonaspis secreta* (Cockerell) infested only species of the Poaceae family and were found only in Algiers.

Census study

Based on the results of our 33-year survey, we identified 79 species belonging to 37 genera in four tribes, 24 of which are considered cosmopolitan species. The Diaspidini tribe is the most abundant with 35 species in 18 genera, followed by the Aspidiotini with 31 species in 15 genera with, the Parlatorini with 12 species in 3 genera the Odonaspidini is the least represented with one genus and one species.

In Table 1 we organized the distribution of the species according to different regions in Algeria; namely Ahmar El Aïn (1), Ain Sefra (2), Algeria (3), Algiers (4), All regions of Algeria (5), All the localities of this host (6), Annaba (7), Arbatache (8), Arris (9), Arzew (10), Aures (11), Batna (12), Bechar (13), Bejaia (14), Bel Abbes (15), Belazma (16), Beni Abbes (17), Beni Ounif (18), Beraki (19), Biskra (20), Blida (21), Boufarik (22), Bouira (23), Boukhari (24), Bouzarea (25), Cap Djinet (26), Chréa (27), Constantine (28), Djanet (29), Djelfa (30), Djurdjura (31), Draria (32), El Harrach (33), Elmeurdja (34), Fort-De-l'Eau (35), Frenda (36), Ghardaia (37), Hacen Badi (38), Hassi Bounif (Oran) (39), Hoggar (40), Issers (41), Jijel (42), Kabylia (43), Khemis Miliana (44), Kolea (45), Media (46), Meftah (47), Messerghin (48), Mila (49), Miliana (50), Mitidja (51), Mostaganem (52), Mouzaia (53), M'Sila (54), Northern of Algeria (55), Oasis (56), Oran (57), Ouargla (58), Oued Rhiou (59), Reghaia (60), Relizane (61), Sahara (62), Setif (63), Sidi Aich (64), Sidi Bel Abbès (65), Sidi Fredj (66), Skikda (67), Staoueli (68), Tablat (69), Tala Guilef (70), Tamanrasset (71), Tassili N'Ajjers (72), Taza (73), Tebessa (74), Tiaret (75), Tikjda (76), Timimoun (77), Tipaza (78), Tizi Ouzou (79), Tizi Rached (80), Tlemcen (81), Touggourt (82). On the other hand the cosmopolite is (**).

The results show that the distribution is not yet complete, as it is to be considered the presence of other species that could not be encountered, but this shows that the majority is located on the northern strip of Algeria where concentrated fruit trees and forests and ornamental.

CONCLUSIONS

This study is the third report dealing with the armored scales fauna in Algeria, the first is reporting in 2005 and the second in 2015. It is intending to present news on the host plants and the biogeography, which have appeared in this region since. The publication of the first contribution 1987. The object of this work is to draw up an exhaustive inventory of diaspine in Algeria, which will be a reference base for other faunistic and zoogeographical studies of this group of insects. Our list is at least an important contribution, quite complete on the armored scales in Algeria, to the overall knowledge.

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