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Quantifying Herbivorous Insects Related by *Juniperus Phoenicea* and *Pistacia Atlantica* Bushes in Cyrenaica, Libya

Abdlrahman. Y. Al Fitori

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Authors affiliation

Plant Protection Department, Faculty of Agriculture, Omar Al-Mukhtar University. P.O. Box 919 Elbida-Libya.

insecta2005@gmail.com

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ABSTRACT

This research was managed in selected locations of - Cyrenaica, Libya to discover the herbivorous insects related via the *Juniperus phoenicea* also the *Pistacia atlantica*. Compressing chosen to converge of the two main species of three study locations, *J. phoenicea* and *P. atlantica*, nine plots were mapped in feature and the insect herbivores modelled from central plants, and next from every plants. The set of insect herbivores composed from plants in the plots were documented to species by the expertise of the employees of the Natural History Museum in London. Several insects evidenced are new to Libya, and there are a number of species not before recorded as feeding on either of the two plant species studied. The commonest species on *Juniperus* in both years of modelling was *Xylomeira* sp. (Bostrichidae), a species that attacks live and dead wood. This strengthen important herbivore that could influence the survival and life-history of juniper in Al Jabal Al Akhdar. In reality, almost all the commonest species on juniper were beetles, counting many wood-boring species, such as *Agrilus* (*Xeragrilus*) sp. (Buprestidae) and *Purpuricenus desfontainii* (Cerambycidae). Obviously juniper is a main supply for beetles in this region. On *Pistacia*, on the previous offer, the commonest species diverse between years, with Orthoptera heading the catalogue in the first sampling year: *Paracinipe* (*Acinipe*) *orientalis*, *Oedopodacae rulescens* and *Scintharista notabilis*. A set of wood-boring beetles were commonest in the second year of sampling, some of which were the same as those on juniper. This variability may indicate that the quality of *Pistacia* as a host varies among years, but we do not really have any real indication as to its basis. Geography is clearly one of the major influences on the distribution of the insect herbivore fauna of Al Jabal Al Akhdar in the Mediterranean ecosystem. The number of recorded species broadly increases with elevation, while middle elevations had the greatest overall insect abundances. Insect damage to plants also increased with elevation. In contrast, the two commonest species had their greatest abundances at the highest (*Xylomeira*) and the lowest (*Oedopoda*) elevations. Herbivore pressure has usually been found to be higher at lower elevations. Herbivorous insect diversity is also impacted by plant architecture, the size, growth form and diversity of feeding niches on the plant. Therefore, area for area, trees have more herbivores species than bushes, which in turn have more than herbs. Several other plant traits are known to affect the diversity of insect herbivores: for example, plant biochemistry, taxonomic affinity and local richness. If herbivore pressure really does increase with elevation in Al Jabal Al Akhdar, then we might predict that defence levels might mirror it. Thus we might predict increasing levels of tannin with elevation.

حصر الحشرات العاشبة المرتبطة بشجيرتي العرعر والبطوم فى برقة - ليبيا

عبد الرحمن يوسف الفيتوري

تم إجراء هذا البحث في منطقة الجبل الأخضر بمنطقة برقة الليبية لدراسة الحشرات العاشبة المصاحبة لنبات العرعر الفينيقي*Juniperus phoenicea*والبطوم الاتلنتيكي.*Pistacia atlantica*بعد اختيار التركيز على النوعين الرئيسيين العرعر الفينيقي*J. phoenicea*والبطوم الاتلنتيكي.*P. atlantica*من مواقع الدراسة الثلاثة، تم تعيين تسع قطع بالتفصيل وأخذ عينات من الحشرات العاشبة من النباتات المستهدفة فى الدراسة، وثم من جميع النباتات المجاورة للنباتات المستهدفة وتم تحديد مجموعة العواشب الحشرية التي تم جمعها من النباتات الموجودة في القطع التجريبية على الأنواع باستخدام خبرة طاقم متحف التاريخ الطبيعي في لندن. بعض الحشرات تم تسجيلها جديدة أول مرة فى ليبيا ، وهناك عدة أنواع لم يتم تسجيلها من قبل على أنها تتغذى على أي من النوعين النباتيين المدروسين كان النوع*Xylomeira* sp (Bostrichidae) أكثر الأنواع شيوعًا على العرعر في فى الدراسة، وهو نوع يهاجم الأخشاب الحية والميتة قد يكون هذا من الحشرات العاشبة الهامة التي يمكن أن تؤثر على بقاء وتاريخ حياة العرعر في الجبل الأخضر في الواقع، كانت الخنافس تقريبًا جميع الأنواع الأكثر شيوعًا على العرعر، بما في ذلك العديد من الأنواع الثاقبة للخشب ، مثل *Agrilus* (*Xeragrilus*) sp. (Buprestidae) و(Cerambycidae) *Purpuricenus desfontainii* من الواضح أن العرعر مصدر رئيسي للخنافس في هذه المنطقة من ناحية أخرى ، تباينت الأنواع الأكثر شيوعًا بين مدة الدراسة، مع وجود حشرات من رتبة مستقيمة Orthoptera على رأس القائمة في الدراسة مثل *Paracinipe* *Oedopodacae rulescens*و *Scintharista notabilis*و *(Acinipe) orientalis* كانت مجموعة من الخنافس الثاقبة للخشب أكثر شيوعًا في العينات ، وبعضها كان مماثلاً لتلك الموجودة على العرعر قد يشير هذا التباين إلى أن جودة البطوم كمضيف تختلف عبر السنين، لكن ليس لدينا في الحقيقة أي مؤشر حقيقي على أساسها من الواضح أن الجغرافيا هي أحد التأثيرات الرئيسية على توزيع الحيوانات العاشبة للحشرات في الجبل الأخضر في النظام البيئي للبحر الأبيض المتوسط. يزداد عدد الأنواع المسجلة بشكل كبير مع الارتفاع فى منطقة الظاهر، في حين أن منطقة الوسيطة لديها أكبر وفرة إجمالية للحشرات. كما زاد ضرر الحشرات بالنباتات مع الارتفاع. في المقابل ، كان النوعان الأكثر شيوعًا لديهما أكبر وفرة في منطقة الظاهر(*Xylomeira*)وأدنى ارتفاعات منطقة الساحل.(*Oedopoda*)عادة ما وجد أن ضغط الحيوانات العاشبة يكون أعلى في الارتفاعات المنخفضة (منطقة الساحل). يتأثر تنوع الحشرات العاشبة أيضًا بتركيب النبات ، وحجم وشكل النمو وتنوع منافذ التغذية في النبات. لذلك ، بالنسبة للمنطقة، فإن الأشجار بها أنواع آكلات أعشاب أكثر من الشجيرات، والتي بدورها تحتوي على أكثر من الأعشاب. من المعروف أن العديد من السمات النباتية الأخرى تؤثر على تنوع الحشرات العاشبة، على سبيل المثال ، الكيمياء الحيوية للنبات، والتقارب التصنيفي والثراء المحلي. إذا زاد ضغط الحيوانات العاشبة بالفعل مع الارتفاع في الجبل الأخضر، فقد نتوقع أن مستويات الدفاع قد تعكس ذلك وبالتالي قد نتوقع زيادة مستويات التانين مع الارتفاع.

INTRODUCTION

Perhaps the primary zoological trip to Libya was that of Friedrich Gerhard Rohlfs among 11-1878 and 10-1879. Rolfs made several trips in the "Libyan deserts." On one arduous journey from Tripoli and Cyrenaica to the Kufra retreat, he collected numerous faunal samples, except that Rohlfs was incredibly unsuccessful as almost every one of the specimens was broken during the attack on the site at Kebabo in Kufra. Shortly after (during the period 1879-9), a quantity of grasshoppers was collected from Tripoli and its suburbs via an Italian sea voyage. These represent the first Libyan samples protected in the National Museum of Tripoli, and housed in the Natural Museum of Civico di Storia in Genoa, Italy (Massa، 2009).

During the year 1881, in accordance with the findings of the Milan examination Society, Giuseppe Haymann made a trip to Cyrenaica with his wife in order to collect animal, plant and archaeological samples. Scientific research in Libya began practically after Italian colonization, next Italy's victories in the fighting with the Ottoman kingdom in 1911-1912. Groups were made during the moment decade of the twentieth century, counting the coastal regions of Tripoli and Cyrenaica. A lot of samples assembled in these regions via entomologists and agronomists for instance Kruger contains stayed unpublished. Some years later, scientific zoological expeditions were conducted under the supervision of Italian scientific institutions to Al-Jaghbub in 1926-1927, Kufra in 1931, Fezzan in 1931 and 1934, and Al-Talisi in 1936; The outcomes were printed in division via Zavattari (1934), who briefed each earlier scientific findings on Libyan fauna (Massa et al.،2004).

Yet between identified insect tests, information of the Libyan fauna stays reduced, with lots of new revises in each confirmable ecological study. For example, Lepidoptera records are sparse and sparse. Torben Larsen's series of books (e.g. Larsen 1990) talk about Middle Eastern butterflies well, and Tennent (1996) has written about the Maghreb, but there is no such evidence for Libya. (Damiano،1961) listed 146 species of Lepidoptera from Libya; (El- Maghrabi MS & Amin،2007) summarized 66 species of Lepidoptera

recorded from Al-Beida from March to December 2000 at a range of sites, 26 of which were new to Libya

Juniper is well-known in the UK for having a specialized insect fauna, but the species richness of its associated insects is not particularly low, given its small distributional area in the UK.. Rather little is known about the insects associated with the *Juniperus* species of the Mediterranean region. Rouault et al.، (2005) looked at insects associated with the cones and seeds of three *Juniperus* species (*oxycedrus, phoenicea* and *thurifera*) in France. Of the nine insect species found feeding in the reproductive structures (one eriophyid mite *Trisetacus quadrisetus*, one weevil *Nan discustran sverses*, two chalcid [Torymidae] wasps of the genus *Megastigmus* and four moths: two species of *Blastotere* [Plutellidae], *Brachyacma oxycedrella* [Gelechiidae], and two species of *Pammene* [Tortricidae]), six were recorded from *Juniperus phoenicea* (only the mite, one *Megastigmus* and one *Pammene* species were lacking). *Nanodiscus transversus* and *Brachyacma oxycedrella* are known to occur in Algeria (Roques et al. 1984). Morphologically very similar but taxonomically unrelated species of weevils (*Anthonomus* spp) from juniper in the USA feed in the fungal galls of *Gymnosp orangium* (Clark & Burke، 2010), but this feeding niche is not known from the Mediterranean. Alygaeid bug *Orsillus pressus* (Rouault et al.، 2005) feeds and oviposits on many Cupressaceae including most species of *Juniperus*.

Even less seems to be known about insects on *Pistacia* species in the Mediterranean, apart from 15 species of galling aphids (Fordinae: Pemphigidae) and their associated food webs (Wool & Mannheim، 1986, Wool & Burstein,1991, Wool، 1995) and seed predators. Aphid galls on *Pistacia* are often occupied by the kleptoparasite site *Palumbina guerrini* (Stainton) (Gelechiidae) which eats the gall tissue (Sattler 1981). The leaves of *Pistacia* in the eastern Mediterranean are often attacked by *Thaumetopoeidae asolitaria* caterpillars (Lepidoptera: Thaumetopoeidae) but these herbivores avoid any aphid galls (Martinez، 2010).

The aim of this research is: first, to identify insects collected on *Juniperus phoenicea* and *Pistacia alentiscus* in the Al Jabal Al Akhdar plots; second, to establish which of these insects are herbivores on the plants; and third, to measure and establish differences in the types of insect herbivory among the top, middle and bottom elevations sampled.

MATERIALS AND METHODS

All nine plots at three elevations in the Al Jabal Al Akhdar region The Al Jabal Al Akhdar(Green Mountain) region in Cyrenaica is the study area of the present fieldwork (Figure).

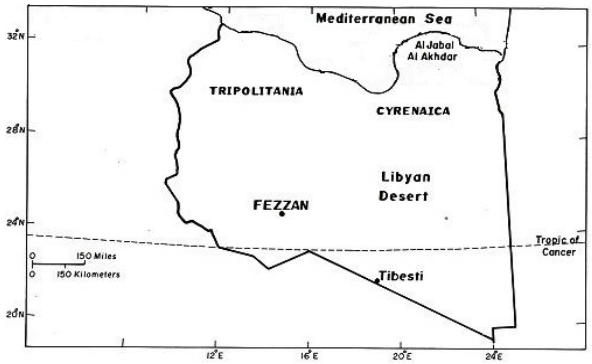

Figure 1: The study region of some region in Cyrenaica, Libya

It is situated directly behind the coastal strip in the north-eastern region of Libya, in Cyrenaica. It extends for about 300 km along the coast, and climbs to an elevation of 881 m above sea level. The massif is rocky crossed by several Wadis (waterways). rainwater ranges among 250-600 mm for every year, a deference able quantity for this hyper-arid state, the happy outcome of the winds from the west pending crossways the Mediterranean, picking up humidity and putting it on the highs massif. Serious red-clay (terra rossa) earths are ordinary (El-Darier &Mogaspi 2009). Just the region contain undergoing from a lack which perhaps a sign of climate change, or can be a usual division of long-term indecisions. There is a discuss between educational in the area whether the lack is causing plants alter or not. Heats are reasonable with any early standard of 16-18 ºC; the hottest high temperatures are on month of05 and 06, with regulars among 25 and 33 ºC.

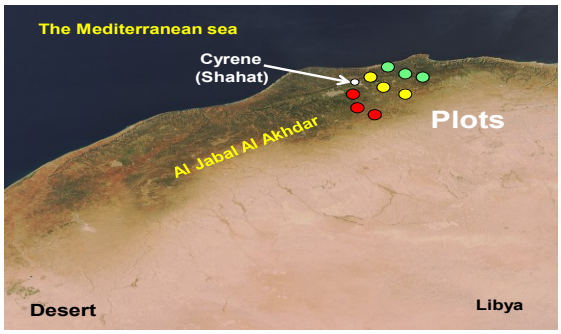

Figure 2: Study designs at 3dissimilaraltitudes (high, centre, and low) of Al Jabal Al Akhdar Mountain. High- (1-3), middle- (4-6) and low-altitude (7-9) designs are designated

Readily available are 3levels of altitudes leaving from the beach to the high mountains, efficiently3 ‘paces’. The coastal strip is concerning three km broad and zero–two hundred meter over sea height in altitude. Next the ground increases to the second ‘step’, a centre strip deceitful at two hundred - four hundred meter over sea height. At last readily available is a vertical slope up to the elevated mountains four hundred–eight hundred and eighty meter over sea point.

We selected 3designs (plots) at every of the altitudes, creation 9designs in whole(
Figure), every close up to the location of Cyrene (Shahat), single of the mainly well-known of every one towns in the very old world of Greece and Rome. The financial system of this town was founded on gathering and importing a medical plant named *Silphium*, a type of Umbellifer. It was assembled to extermination.
Every design was fifty by fifty meter (Figure 3); in all design, the initial angle was selected via chance organizes, and the previous selected in order that 1 side was similar to the sea. These angles were charted by GPS. The design dimension was selected to be big sufficient in order that there were at smallest quantity thirty species of every central plant species in the slightest-intense design. Enduring angle positions were shaded red to assist discover them once more, and there were provisional positions at ten meters gaps inside the design; a detection scope guaranteed the rows were directly. We evidenced universal design states for example feature, slope, elevation, and earth kind and earth deepness.

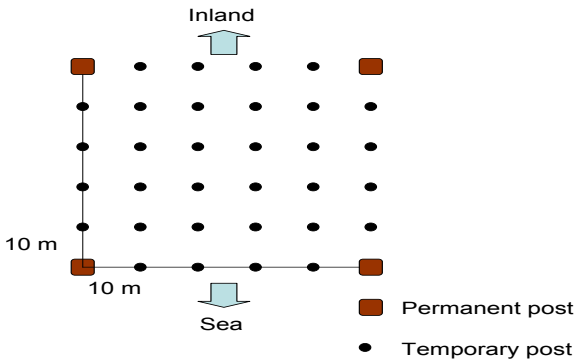

Figure 3: Model of enduring (Permanent) and provisional (Temporary) positions created every design so as to plan every plant inside all study design

We after that charted the locations of the centres of all *Juniperus* and *Pistacia* plant, in addition previous trees and bushes (described as several forested plant upper than half meter) of every kinds inside the design, by spaces and positions from the seaward positions. were vacationed in chance .we exampled arbitrarily selected central hierarchies of *Juniperus* and *Pistacia* (number five of every kinds for each design, ninety in whole), we tasted all charted hierarchy or bush in the design for insects. We assembled leaf and insects tasters from all hierarchy and bush.

Insect injure to leaves and insect irritates (galls) were collected from every plant in the next way. If the chosen plant was a huge tree or bush, after that everyone the major stems were figured and one selected at chance; this methods was do a gained for sub-stems, sub-sub-stems and branches of the selected stem, Small branches with a collection of twigs and leaves were selected. If we found tumours or insects on the branches, a branch was selected at random; If the tumour is on the leaves, one leaf is selected at random. If we find insect damage on the selected branch or leaf; It was captured and stocked alone in a vial. This methods was recurring awaiting we had full fifty vials or exampled one thousand leaves. If the chosen plant was a small shrub, we took random amounts of leaf samples directly, repeating this several times until we filled fifty tubes or sampling a thousand leaves or all leaves of the shrub, whichever was achieved first. Most of the tumors found were caused by aphids (Homoptera: Pemphiginae: Fordini), with Ford riccobonii present everywhere. Free-living insects were collected using nets and beatings. The insect specimens obtained were killed by freezing, repaired, classified and afterwards known at the Natural History Museum in London in collaboration with Max Barclay, an expert on insects, especially beetles. We selected the terraces at random, except we tripped one design of ground in all awaiting every of them were visited, after that we begined once more. designs within altitudes were visited in chance direct, and we tried to whole sampling from a only design more than a little successive times. In 2008, we exampled different trees used to look at leaf chemistry, so sampling 5 of all kinds in all design, every at first chosen at random inside the design and organism at least fife meter from the border. In 2009, we sampled each tree or bush diagrammed on the design for insects. The plan was first to walk around the tree/shrub and observe what insects were present, catching those reachable without disturbance. Then we worked through the foliage by hand, starting from the top, thoroughly and systematically turning over leaves and branches. Initially until the range had been fully appreciated, all insects were collected from each individual tree/shrub, and after that we counted the number of each type. It took more than one day to sample five plants. Every individual insect was given an identification code that tracked when, where and on which plant it was collected.
Several different insects were kept active to determine whether the species was actually a herbivore of *Juniperus* or *Pistacia*. We located a solitary insect in a Petri dish with a few slash parts of unconsumed leaf fabric and a pile of damp paper handkerchief. The insects were confirmed regularly, and following 48 hours we renowned which ones have or have not nourish. everyone were after that ice-covered and stickled. The dissimilarity among factual herbivores and other insects is completed obvious in the outcomes part.
The evaluation of the figures of different insect nuisance species was completed via cautiously investigative the chosen crowd plants; leaf with leaf and turn-off leaves also to gather some insects as of the under-surface of the leaves. The insect herbivores gathered from every design were known, counted and evidenced. Proportion leaf injure was rooted in the whole figure of leaves injured in specimen separated via the whole figure of leaves in the specimen. (Ogunjobi et al، 2005).
This research concentration on the insect herbivores so as to nourish on the leaves of *Pistacia* and *Juniperus*, with several to attack the stem, if established. There are

insect herbivores that were not studied for not have of time, for instance those that eat on kernels, crops, origins or that survive below the woof.

The information (figures of species, figures of persons) were examined by a steady put of prophets in the next command: *species* (*Juniperus/Pistacia*), *level*, *plot-within-level*, the *species*level* interaction and plant *surface area* (covariate). Where appropriate, we used a generalised linear model since from time to time general linear models with normal errors did not have homogeneous variances, and this was not correctable with transformation (log or sqrt). In such cases we employed a generalised linear model with Poisson errors; if a model was over-separated, we employed quasi-Poisson mistakes by the extend deviance because the extent limit.
The insects gathered from *Juniperus phoenicea* and *Pistacia alentiscus* with recognized from specimens. Dissimilar experts kindly assisted by the detection.

a) Information on noticeable person shrubs of *Pistacia* and *Juniperus*.

For the 45 noticeable shrubs of every of the two main species, the amount of species of insects on *Juniperus* were larger than on *Pistacia* what so ever places (Figure 1), a very important result (Table 1). There were no in general dissimilarities in species affluences with altitude, except there was a important species * level communication(Table 1), exemplified in (Figure 1): for *Juniperus*, the centre point had the peak species affluences, while for *Pistacia*, this had the smallest species affluences. The belongings of altitude were comparatively tiny (see Figure 1). There was no conclusion of plant outside region on species affluences.

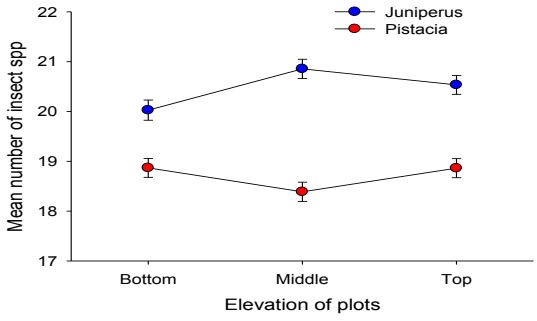

Figure 1:median symbol (± s.e.) of insect species located on decided shrubs of Juniperus with Pistacia in lasting complots at three dissimilar set ups in the Al Jabal Al Akhdar work area.

Table 1: :Examination of the symbol of insect species found on decided shrubs of Juniperus and Pistacia in lasting complots at three dissimilar altitude in the Al Jabal Al Akhdar work at place. The replica was conformed with simple mistakes

Source	Type III		
	Wald Chi-Square	df	Sig.
species	124.965	1	<.001
level	1.700	2	.427
level * species	11.699	2	.003
plot(level)	17.568	6	.007
surface area	.132	1	.717

Mostly insect intensity on *Pistacia* were a lot of bottom than on *Juniperus* (Figure 2, Table 2). There were important general outcomes of altitudes, as well as a important species * level reaction (Table 2). The mid-altitude complots had large digits of insects, yet this result was much extra distinct for Juniper than for *Pistacia* (Figure 2).once more there was no do of plant aspect zone.

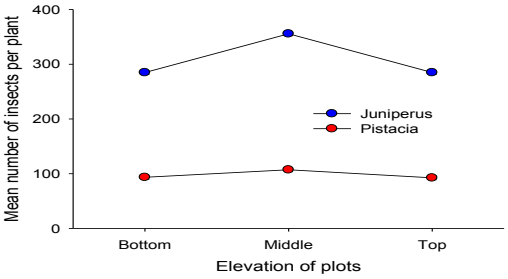

Figure 2: Average symbol (± s.e.) of single insects find on noted shrubs of Juniperus and Pistacia in lasting complots at three dissimilar altitudes in the Al Jabal Al Akhdar research area. The degree mistake are very little to be visible.

Table 2:study of the numeral of sole insects find on noted shrubs of Juniperus and Pistacia in lasting complots at three dissimilar altitudes in the Al Jabal Al Akhdar research area. The replica was shaped by standard mistake.

Source	Type III		
	Wald Chi-Square	df	Sig.
species	5513.225	1	<.001
level	190.074	2	<.001
level * species	89.855	2	<.001
plot(level)	58.124	6	<.001
surface area	.163	1	.686

The Kind of herbivory on Pistacia vary between plot; there was comparatively small injury to leaves, yet nearly all of the injury that was there was on small leaves, raised on grasshoppers (Acrididae) for several present of Lepidoptera and Homoptera. Generality galls were effect via aphids, casted at whole plots. There were no leaf pits. however there was big inter-plot difference, injury to leaves raised a bit yet significantly for altitude (Figure 3, Figure 8, and Table 3). Mark injury to leaves was smallest at the low altitudinal level (average of 5.5 ± 0.9 % of leaf injured

by marks), at like scales at medium (7.8 ± 0.9) while peak scales (7.5 ± 0.9), only these variances were not considerable (glm with standard mistakes, $\chi^2 = 3.9$, df = 2, p = 0.34). Gall injury to leaves was likewise high-rise in the central altitude (Figure 4).

The juniper bush (*Juniperus phoenicea*) does not have foliages that can be evaluated for infection, so we cannot do the following analyse that were completed on *Pistacia* for this plant. The ultimate widespread harm was raised via shrub crickets (Tettigoniidae) and Apatele sp. butterflies (Noctuidae). In the farm, pistachios rising near to *Juniperus* showed to resort to draw extra harm than those rising only. There were no leaf mines in *Juniperus*. (Table 4) shows the maximum current species gathered from clear persons of Juniperus and Pistacia in the sampling time.

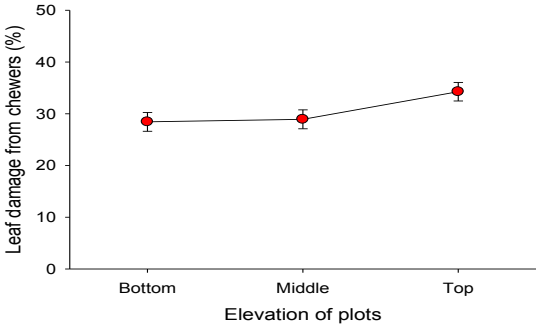

Figure 3: Standard harm (± s.e.) from crunch insects (%) to leaves on cleared shrubs of *Pistacia* in constant lands at three several altitudes in the Al Jabal Al Akhdar research locations

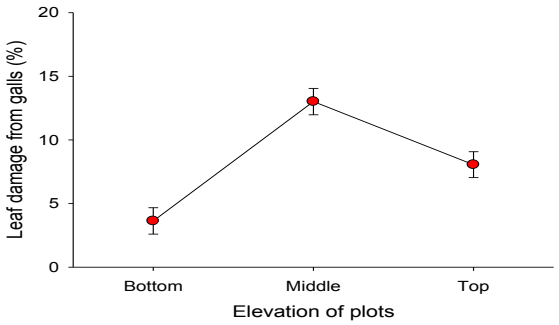

Figure 4: Mean harm (%) (± s.e.)to leaves from insect galls on cleared shrubs of Pistacia in constant plots at three various altitudes in the Al Jabal Al Akhdar research areas. The dissimilarities are maybe significant, just the facts were not plain and could not be normalized via every transformation. Under ArcSine conversion, for instants, there were dissimilarities between planes ($\chi^2 = 50.0$, df = 2, p<0.001) only the residuals were yet non-normal (Shapiro-Wilk = 0.931, df = 45, p=0.011).

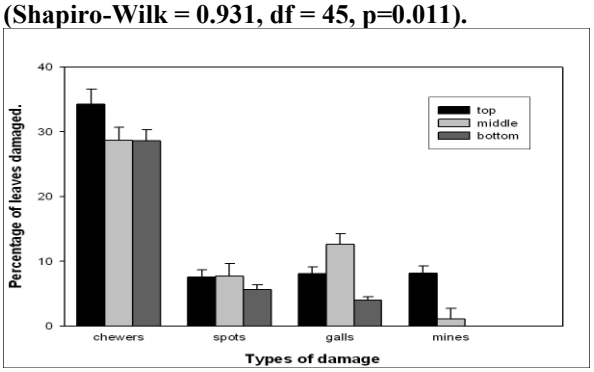

Figure 4: Figures of insect harm on Pistacia leaves with altitude. averages (± s.e.)

Table 4: The currents insect species calmed in guild via the distinct shrubs/trees in the area complots. 45 singles plants of all species were survey by drifting and show. a few species were obviously not

INSECT SPECIES	*Juniperus*	Mean	±SEM	*Pistacia*	Mean	±SEM
Xylomeira sp	1328	1.50	0.083	90		
Agrilus (Xeragrilus) sp	1168	1.32	0.076	62		
Anthia (Termophilum) venator	1117	1.26	0.071	50		
Tropinotas qualidapilosa	1161	1.31	0.066	62		
Purpuricenusdes fontainiides fontainii	1240	1.40	0.057	116	0.101	0.026
Niphona picticornis	870	0.98	0.036	100	0.069	0.026
Stromatium unicolor	680	0.77	0.028	140	0.056	0.025
Oedopoda caerulescens	434	0.49	0.026	341	0.069	0.023
Paracinipe (Acinipe) orientalis	402	0.45	0.027	373	0.130	0.020
Scintharista notabilis	360	0.41	0.028	337	0.112	0.018
Autographa gamma	361	0.42	0.026	325	0.158	0.015
Vanessa cardui	399	0.45	0.024	303	0.384	0.011
Maniola sp	383	0.43	0.023	310	0.420	0.011
Cicadellidae: leaf hopper	436	0.49	0.017	263	0.380	0.009
Cicada barbara	520	0.58	0.011	250	0.366	0.008
Psalmochariassp	540	0.61	0.009	291	0.341	0.007
Anoplocerussp	624	0.71	0.004	269	0.349	0.007
Bothrostethus sp	621	0.70	0.005	254	0.296	0.006
Latilica sp	590	0.66	0.006	217	0.282	0.006
Orsillus sp	627	0.71	0.083	234	0.328	0.007
					0.303	0.005
					0.286	0.004
					0.244	0.003
					0.264	0.026

Table 5: The average figure of insect species gathered in organization by the shrubs/trees in the research sites, tested via brushing and hitting in 2009.

level	species	Mean	Std. Error	N
Bottom	*Ceratonia*	43.635	2.597	12
	Juniperus	43.446	.594	257
	Olea	46.665	6.307	2
	Periploca	46.010	4.467	4
	Phillyrea	44.102	3.650	6
	Pistacia	44.457	.700	165
Middle	*Calicotome*	45.872	1.233	54
	Ceratonia	48.216	2.979	9
	Juniperus	44.716	.474	358
	Olea	41.592	3.452	7
	Phlomis	44.410	3.398	7
	Pistacia	43.912	.472	382
	Sarcopoterium	48.106	2.238	16
Top	*Arbutus*	46.826	4.000	5
	Juniperus	46.131	.555	269
	Pistacia	46.230	.485	345

Herbivores of every plant.

Herbivores of every plant.

(b)Information from every trees/shrubs in each plan.

To study species abundances on plants, we hired a quaisPoisson error building since the residues were non-normal (Shapiro-Wilk 0.996, df=1890, P<0.01).

Astonishing, there were no notables dissimilarities between plant species in the digit of insect species all plant (Table 6), yet there was an grow by altitude (Figure 5). Trapping the facts to the two central

species, there were no notable dissimilarities in insect species plenty total among *Pistacia* and *Juniperus* (χ^2 = 0.05, df = 1, n.s.), nor any species * level interaction (χ^2 = 2.49, df = 2, n.s.).

Table 6: study of the signify figure of insect species gathered in organization by the shrubs/trees in the research sites.

Analysis of replica Results

Source	Type III		
	Wald Chi-Square	df	Sig.
species	4.282	9	.892
level	19.816	2	<.001
level * species	4.091	4	.394
plot(level)	116.672	6	<.001
surface area	.022	1	.881

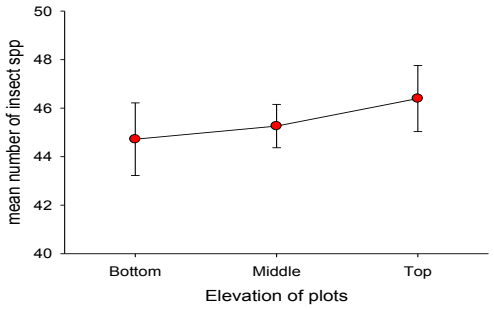

Figure 5: Mean figure (± s.e.) of insect species determined on shrubs/trees in stable plans(plots) at three dissimilar altitudes (elevations) in the Al Jabal Al Akhdar research site (2009 data). The dissimilarities are very important (Table 6)

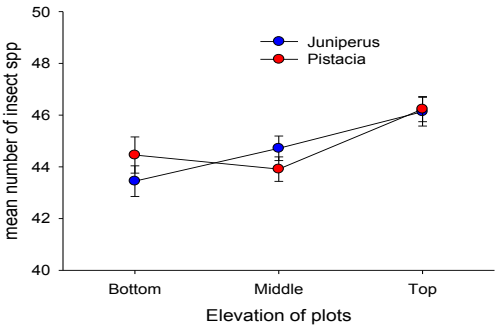

Figure 6:Meanfigure (± s.e.) of insect species determined on shrubs of Juniperus and Pistacia in stable plans at three dissimilar altitudes in the Al Jabal Al Akhdar research area (2009 data).

The general figures of signal insects for each plant was examined by a glm by standard mistakes. The average significances are provided in (Table 7). Once more there were no important dissimilarities between plant species (Table 8), Except important dissimilarities largely between the three heights, by figures rising as of base to peak altitudes (Table 5). limiting the examinations to the two central plant species, there were no generally dissimilarities ($\chi^2 = 0.22$, df = 1, n.s.) except there was a important species * level interaction (Figure 3-7); $\chi^2 = 6.75$, df = 2, $p<0.05$).

Table 7: The average figure of signal insects gathered in organization by the shrubs/trees in the research sites, collected by brushing and hitting in 2009.

level	species	Mean	Std. Error
Bottom	*Ceratonia*	115.280	12.521
	Juniperus	127.564	2.864
	Olea	126.411	30.407
	Periploca	122.230	21.537
	Phillyrea	134.835	17.596
	Pistacia	131.282	3.376
Middle	*Calicotome*	134.260	5.945
	Ceratonia	147.037	14.360
	Juniperus	138.107	2.285
	Olea	120.709	16.641
	Phlomis	116.954	16.382
	Pistacia	129.604	2.276
	Sarcopoterium	142.339	10.790
Top	*Arbutus*	143.004	19.283
	Juniperus	138.400	2.674
	Pistacia	139.745	2.337

Table 8:Test of the Average figure of single insects calmed in guild by the shrubs/trees in the research Ares.

Source	Type III		
	Wald Chi-Square	df	Sig.
species	2.460	9	.982
level	11.497	2	.003
level * species	8.735	4	.068
plot(level)	84.635	6	.000
surface area	.289	1	.591

The Total figures of the joint species on *Juniperus*, *Xylomeira* sp, were tested via a Glm by simple mistakes For 2008 facts, there were notable dissimilarities between flats (Wald $\chi^2 2 = 75.4$, $P<0.001$) by mid-altitude areas including the high intensities. For 2009 facts, there were still notable dissimilarities between the 3 flats (Table 9), via figures per tree raising from the base (2.38 ± 0.18) to peak (3.39 ± 0.18) altitudes.

Table 9: Study of the average number of Xylomeira sp gathered in union by the Juniperus sp in the research areas.

Source	Type III		
	Wald Chi-Square	df	Sig.
(Intercept)	.452	1	.501
level	8.293	2	.016
plot#(level)	26.115	6	.000
No. individuals on the nearest on specifics	6.438	1	.011
No. individual on the nearest allospecific	30.741	1	<.001
No. individual on all *Juniperus* within 2 m	5.744	1	.017

The Total numbers of the joint species on *Pistacia*, *Oedopodacae rulescens* were too studied by GLM via common errors. For 2008 facts, there were notable dissimilarities between flats (Wald $\chi^2 2 = 12.5$, $p<0.01$), by the biggest intensities at the peak altitudes. For 2009 data, there were no notable dissimilarities between flats (Table 10), yet the average amounts reduced from lower (1.48 ± 0.06) to upper (1.31 ± 0.06) altitudes.

Table 10: Study of the average number of Oedopodacae rulescens gathered in union by the Juniperus sp in the research areas.

Source	Type III		
	Wald Chi-Square	df	Sig.
(Intercept)	2.805	1	.094
level	10.702	2	.005
plot#(level)	43.008	6	<.001
No. individuals on the nearest onspecifics	9.493	1	.002
No. individual on the nearest allospecific	35.968	1	<.001
No. individual on all *Juniperus* within 2 m	17.542	1	<.001

In expressions of the kinds of insect harm on *Pistacia* leaves (Figure 8), there were small if all variations by elevation in the deals of several practical calls of insect herbivores. In GLMs by normal errors, harm from battings offered no variations between flats ($x^2 = 3.91$, df = 2, ns) and nor did patch harm ($x^2 = 2.11$, df = 2, ns). In contrast, there were net elevation results on the harm made via gallers (non-parametric KW = 22.1, df =2, $p<0.001$) and miners (KW = 29.1, df = 2, $p<0.001$).

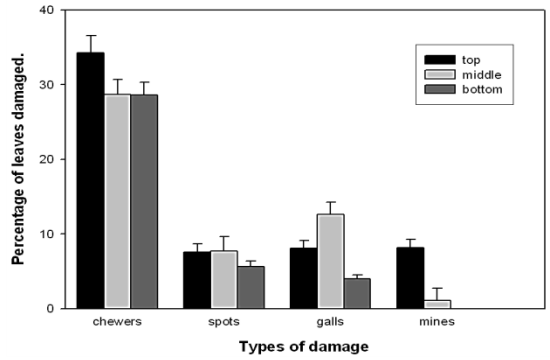

Figure 8:Guides of insect harm on Pistacia leaves by altitude. Averages (± s.e.)

Discussion

The widespread species on *Juniperus* in together years of previewing was *Xylomeira* sp. (Bostrichidae), a species so as to assaults live and dead wood. This may be a important herbivore to might influence the death and life-history of juniper in Al Jabal Al Akhdar. Actually, approximately every the widespread species on juniper were beetles, comprising a lot of wood-boring species, for example *Agrilus* (*Xeragrilus*) sp. (Buprestidae) and *Purpuricenus desfontainii* (Cerambycidae). obviously juniper is a main supply for beetles in this region.

On *Pistacia*, moreover, the widespread species different among years, for Orthoptera order the record in the primary selected year: Paracinipe (Acinipe) orientalis, *Oedopoda caerulescens* and *Scintharista no*tabilis. A collect of wood-boring beetles were widespread in the next year of testing, several of that were the same as those on juniper. This difference might mark which the fitness of Pistacia as a steward vary between years, yet we do not in fact have some actual evidence as to its foundation.

Geography is obviously one of the main impacts on the dispersal of the insect herbivore fauna of Al Jabal Al Akhdar in the Mediterranean ecosystem. The figure of noted species largely rises by altitude as mid altitudes had the hugest whole insect plenty. Insect harm to plants too raised by altitude. On the contrary, the two widespread species had their most plenty at the peak (*Xylomeira*) and the lowest (*Oedopoda*) altitudes. Herbivore load has usually been established to be top at down altitudes, from researches of insect herbivore plenty beside altitudinal slopes in together orbital and moderate areas (Fernandes& Price, 1988). We have no facts on the comparative recurrences of mammalian herbivores in the research site.

These models may fully too think variations in abiotic situations by altitude. Describing models in insect herbivore force via altitude was not the centre of this study, and thus no private observing of potential descriptive changing was promise. Via rising altitude, there is an rise in rays density, soils are usually extra opened and surface, and have reduced nutrient accessibility and decrease moisture-retaining capacity (Sarmiento, 1986). Therefore there may be a slope of decreasing water and/or nutrient accessibility, coupled with increasing photosynthesis: plants at higher elevations should make an glut of carbon (Mattson، 1980) and thus the concentration of minor mix including carbon, for instance tannins, must increase at higher altitudes (Bryant et al.، 1983;Sarmiento، 1986).

The relation loads of the two trees were generally alike in mainly locations. Geographically extensive species of plant be inclined to have additional species of insects supplying on them than alike except less common species, a actuality first documented with (Strong et al،1984). There are three universal methods thinking to below recline the species-area association among insects and their host plants. Common species of plants happen in extra locales and more than a broader variety of climatic areas than rare plants. Then varied species of insects are established in dissimilar parts of the varieties of common plants. Secondly, common plants there extra obvious 'goals' for colonizing creatures. Thirdly, little inhabitants on plants by limited varieties possibly extra flat to death.

Herbivorous insect variety is too affected via plant building, the volume, development shape and variety of nutrition shelters on the plant. Thus, space for space, trees

have additional herbivores species than shrubs, that in transformation have additional than grasses. Some else plant features are well known to influence the variety of insect herbivores: for instance, plant biochemistry, taxonomic empathy and native fertile. If herbivore force truly does rise by altitude in Al Jabal Al Akhdar, then we may prophesy that protection flats may be it. So we may prophesy rising flats of tannin by altitude.

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