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Faculty of Exact Sciences, Natural and Life Sciences
Agronomy Department

MASTER THESIS

Natural and Life Sciences
Agronomic Sciences
Plant protection
Réf. :…………………………………..

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Theme :

Effect of *Artimisia herba alba* extracts against aphides at Biskra oasis

Biskra : …………………………..

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Abstcrat

Some plants are known for their ability to synthesize secondary metabolites with insecticidal properties These metabolites may be exploited in the field of insect pest control or vectors of infectious agents. The objective of this study is to identify insecticidal properties a spontaneous plant collected from the Algerian Sahara (Tamanraset region): Artemisia Alba . The ethanolic extract crude was prepared by maceration. Bioassays were carried out on eggs and larvae of I, II and III stage of the common mosquito Culiseta longiareolata. A series of three doses for eggs and four doses for larvae have been tested. The results show that, at high doses, the extract completely inhibits the eggs. The tested extract has good insecticidal activity on the larvae. The median lethal dose (LD50) has was reached after two hours of treatment, reflecting the excellent insecticidal effect of this extract The results obtained are encouraging and suggest the possibility of using the secondary metabolites ofArtemisia Alba as a bio-insecticide for vector control

Résumé

Certaines plantes sont connues par leurs capacités à synthétiser des métabolites secondaires ayant des propriétés insecticides. Ces métabolites peuvent être exploités dans le domaine de la lutte contre les insectes nuisibles ou les vecteurs d'agents infectieux. L'objectif de cette étude est d'identifier les propriétés insecticides d'une plante spontanée récoltée dans le Sahara algérien (région de Tamanraset) : Artemisia Alba . L'extrait éthanolique brut a été préparé par macération. Des essais biologiques ont été réalisés sur des œufs et des larves de stade I, II et III du moustique commun Culiseta longiareolata. Une série de trois doses pour les œufs et quatre doses pour les larves ont été testées. Les résultats montrent que l'extrait inhibe complètement les œufs. L'extrait testé a une bonne activité insecticide sur les larves. La dose létale médiane (DL50) a été atteinte après deux heures de traitement, ce qui reflète l'excellent effet insecticide de cet extrait Les résultats obtenus sont encourageants et suggèrent la possibilité d'utiliser les métabolites secondaires de l'Artemisia Alba comme bio-insecticide pour la lutte contre les vecteurs.

ملخص

تشتهر بعض النباتات بقدرتها على تصنيع المستقلبات الثانوية بخصائص مبيدات الحشرات ، ويمكن استغلال هذه المستقلبات في مجال مكافحة الآفات الحشرية أو نواقل العوامل المعدية. الهدف من هذه الدراسة هو التعرف على خصائص المبيدات الحشرية لنبتة عفوية تم تم جمعها من الصحراء الجزائرية (منطقة تمنراست): Artemisia alba. أجريت . تم تحضير خام المستخلص الإيثانولي بالنقع. الاختبارات الحيوية أجريت على بيض ويرقات الباعوض ، المرحلة الأولى والثانية والثالثة.تم اختبارها على سلسلة من ثلاث جرعات للبيض وأربع جرعات لليرقات. أظهرت النتائج أنه عند الجرعات العالية ، يثبط المستخلص البيض تمامًا. المستخلص المختبَر له نشاط مبيد حشري جيد على اليرقات. تم الوصول إلى الجرعة القاتلة المتوسطة LD50 بعد ساعتين من العلاج ، مما يعكس التأثير للحشرات لهذا المستخلص. النتائج التي تم الحصول عليها مشجعة وتقترح إمكانية استخدام المستقلبات الثانوية كمبيد حشري حيوي لمكافحة ناقلات الأمراض.

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Introduction

Introduction:

Aphids are familiar, soft-bodied, pearshaped insects with tremendous reproductive potential. As sap feeders, they can cause plants to wilt or seedlings to die; their excess fluid waste, called honeydew, attracts a variety of hungry flies, ants, wasps, bees and even rodents. Some species cause growth distortion or galls on their hosts, while others are vectors of certain plant pathogens. As a group, they demonstrate such a variety of host preferences and survival strategies that no generalized account can describe them adequately. Only a few common species affecting ornamentals are discussed below Aphids feed by sucking sap from plants. When the number of aphids on a plant are very high for an extended period, their feeding can cause wilting and sometimes even dieback of shoots and buds leaves.

in Algeria we have a considerable floristic wealth. This potential of medicinal plants has thousands of species with diverse interests in the food and pharmaceutical field the *Artemisia herba alba*) is an hermaphrodite, perennial and spontaneous plant. It is aMediterranean and Saharo-Indian species (Ozenda 1977). It is very common in North Africa and in the Middle East It is widespread in the highlands but rare in the northern Sahara.Plants of the genus Artemisia (family Asteraceae, tribe Anthemideae) have been used in folk medicine by many cultures since ancient times but as it kowen the Use of plant extracts as insecticides has been known for a long time. Indeed, the pyrethrum, nicotine and rotenone are already known as insect control agents (Crosby and al., 1966). According to Jacobson (1989), more than 2000 plant species with insecticidal activity are already identified. Recently, the alder litter, plant rich in polyphenols proved to be gifted important toxic properties as we could se in our thieses the proprties of the artimisia herba alba plant and it insecticidal activity againset the aphides as its considered a big problemes for the the agruicultuer in algeria a real control strategy must be developed that integrates bio-chemical control, biological control and prophylactic measures

Chapter I

Generality on Aphids

1-Identification :

Aphids are familiar, soft-bodied, pear-shaped insects with tremendous reproductive potential. As sap feeders, they can cause plants to wilt or seedlings to die; their excess fluid waste, called honeydew, attracts a variety of hungry flies, ants, wasps, bees, and even rodents.Some species cause growth distortion or galls on their hosts [1]they are members in the superfamily Aphidoidea Their common names include greenfly or blackfly individuals in the species vary widely in color They are usually found in large numbers (colonies) on the undersides of leaves or stems. There are both winged and wingless aphids (KLASS, 2012) Aphids are among the most destructive insect pests on cultivated plants in temperate regions In addition to weakening the plant by sucking sap, they act as a vector for the plante viruses and disfigure ornamental plants with deposits of a honeydow and the subsequent growth of Aphids are the most common insects found on trees, shrubs, and garden ornamental plants. Over 350 different aphid species occur in the state but most can feed on only a few species of plants [2]Control of aphids is not easy. Insecticides do not always produce reliable results, given resistance to several classes of insecticide and the fact that aphids often feed on the undersides of leaves. On a garden scale, water jets, and soap sprays are quite effective, Aphids are found on almost all types of plants and a few species can cause plant injury (Carol, 2010)

2-Distribution :

- aphids exhibit a variety of habitats and hosts they are distributed worldwide but are most common ina lot of temperate zone.

nearly every species of ornamental or greenhouses, or anywhere outdoors will have at least one aphid or aphid relative that will use it for a host Some common aphid species in greenhouses can continue parthenogenetic reproduction all year long, aided by warmer temperatures, availability of well-fertilized, succulent hosts and artificial lighting. Many other common aphid species overwinter as eggs on the bark of woody perennials but spend their summers on other species or herbaceous hosts[3] the possibility of migration in aphides are considered as very high generally with passive dispersal by wind, some could rise about 600m in the air where they are transported by strong winds, aphids can also be transmitted by agricultural materials(Carol A)

3- Evolution :

the life cycle of aphides are among the most remarkable in any animal group they include parathynogenitcs and sexual generations, although the complexity and diversity of aphids life cycles are often grave, those life cycles draw both entomologists and biologists for several of reasons we mention two of the primary reasons first they certain aphids species are agricultural pests and studies of the life cycle can be effective in the contrôle measures secondly aphides are a great study organism for understanding evolutionary biology.(Carolyn Klass, 2012)

3-1 Life history

- Aphidoidea, the so-called "true aphids" are one of the most challenging groups in terms of solving the phylogenetic relationships. Morphology-based analyses were strongly affected by widespread homoplasy, while the molecular-based attempts struggled with the lack of sufficient phylogenetic signal. Despite significant improvements, the higher classification remains unresolved and rather controversial. However, the use of the fossil record,[1]Most species of aphids overwinter in the egg stage. The eggs hatch in the spring to produce a generation of females. These female aphids give birth to living young. Generally, the first young aphids are wingless, and when a colony becomes too crowded winged forms may be produced. The winged forms migrate to new host plants and begin colonies. Enormous populations are built up from these overlapping generations all summer long. Late in the season, the aphids migrate back to the original host plant, and a generation consisting of both males and females is produced.[2] Which overwinter the female lay eggs and start monitoring for the beginning of an aphid population build-up(Hull,2017)

4-Taxonomy

- Reliable identification of species is essential for the integrated management of pest aphids and the early detection and risk analysis of newly introduced species (Miller & Foottit 2009). Molecular taxonomic approaches have provided additional valuable characters for the resolution of taxonomic problems and the discovery of new species within the Aphididae (Foottit 1997) [1], the aphid insect can be placed in two différent superfamilies, Aphidoidea or phylloxeroidea, which contains the family Adelgidae and the family Phylloxeridae Like aphids, phylloxera feed on the roots, leaves, and shoots of grape plants, but unlike aphids, do not produce honeydew or cornicle secretions, The first attempts to reconstruct aphid phylogeny based on morphology resulted in conflicting evolutionary scenarios Although the division of aphids into three main lineages—Aphidoidea with viviparous parthenogenetic females, and Adelgoidea and Phylloxeroidea with oviparous parthenogenetic females (classification follows [were congruent among both studies, relationships within the Aphidoidea, which represent. 90% of recent aphid diversity, remained unresolved. A general impediment for phylogeny reconstruction and building natural classification of aphids is the paucity of morphological synapomorphies for higher-level lineages and difficulty in determining whether a certain feature is an ancestral (plesiomorphic) or derived (apomorphic) state (J Joe Hull)

5- Phylogénie

- Nowadays we are witnessing an increased appreciation of the fossil record for reconstructing the phylogeny of particular groups and testing macroevolutionary hypotheses Fossils are a tremendous source of information regarding the tempo and mode of lineage diversification and trait evolution, thus the best way to use them is by analyzing data from living and fossil species together in a phylogenetic framework [, Despite the undoubted advantages, this approach also brings many challenges, especially for such a complex group as aphids, and it has been applied in a very limited way for studying aphid evolution, The oldest representative of a lineage presumably leading to recent aphids is Leaphis prima Shcherbakov, 2010, known from the early Anisian (Middle Triassic) of the Vosges, France. Recently Szwedo et al.] described a new superfamily Lutevanaphidoidea from the Middle Permian of the Lodève Basin, France, and assigned it to Aphidomorpha. However, in our opinion, the affiliation of this taxon to aphids should be further explored, e.g. because of the presence of a distinctly developed clavus on the fore wings. Most Triassic aphids are known from isolated wings, except the Dracaphididae from the superfamily s, which were described from the Middle Triassic of China. The assignment of Naibioidea to aphids, however, remains controversial. Originally Shcherbakov(J Joe Hull,)

5.1-External phylogénie

Figure N°1 presents the external phylogeny

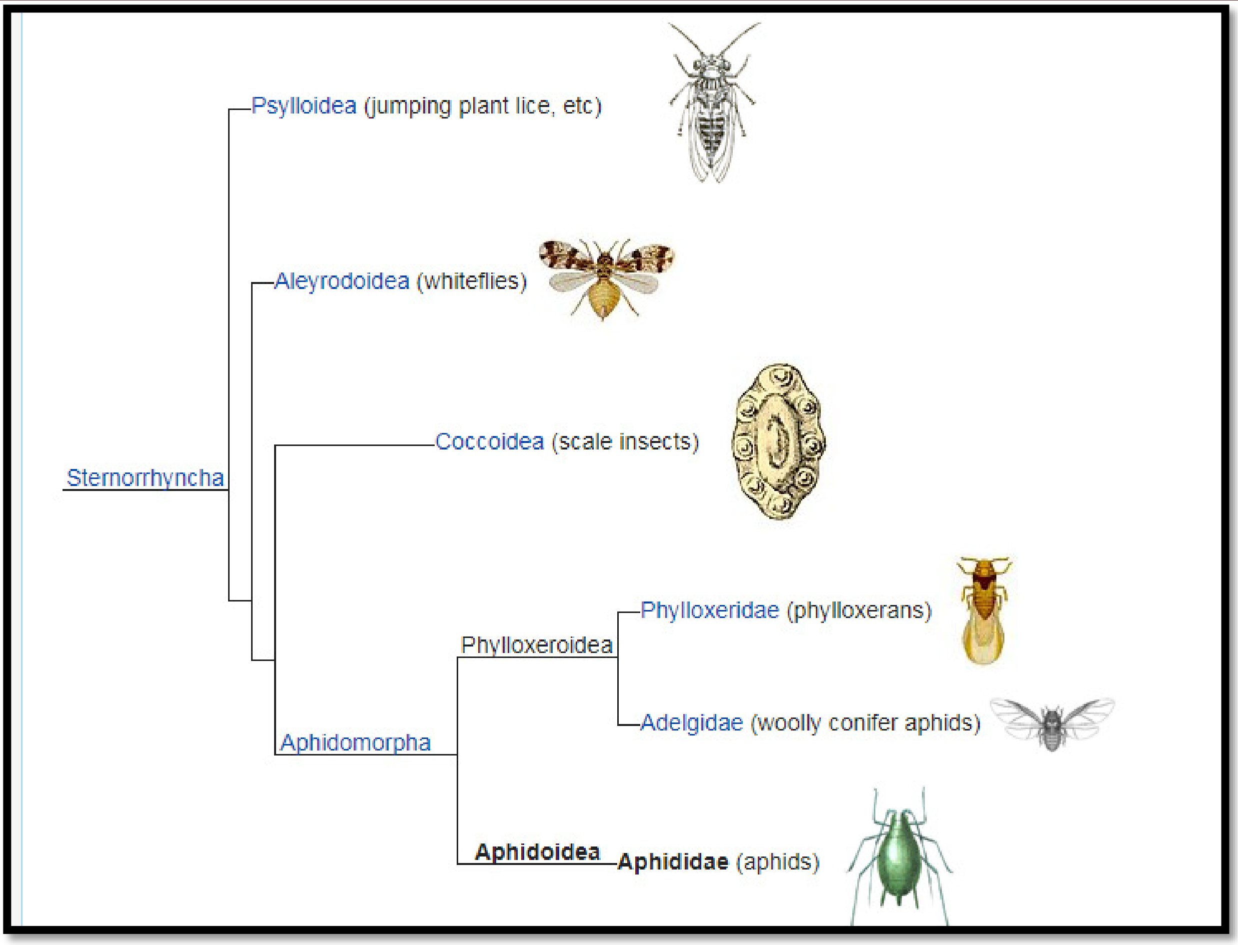

Fig. 01 : Different families and sub-families of aphids

5.2- Internal phylogénie

The Different subfamilies of the Aphidinae as well as the position of the species are presented as follows

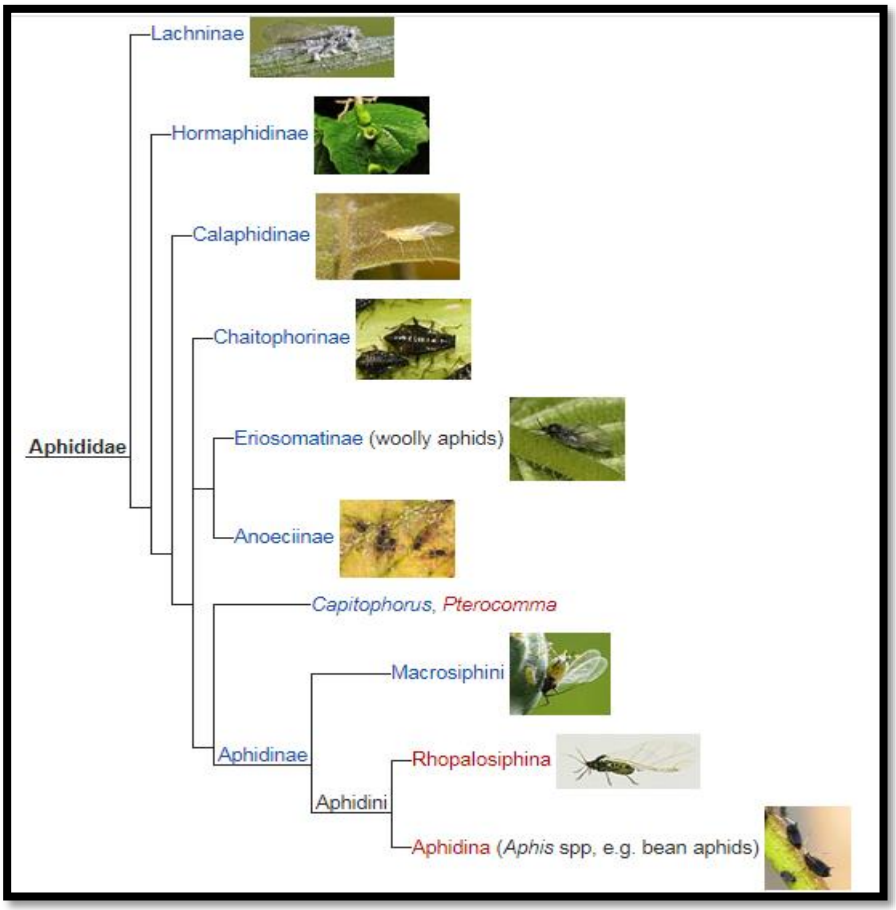

Fig. 02 Different subfamilies of the Aphidinae as well as the position of the species

6-Reproduction

Aphid populations can grow profusely because they exhibit cyclic parthenogenesis which combines sexuality and parthenogenesis, and, depending on crowding conditions or plant quality, they are capable of producing either winged or wingless parthenogenetic females. However, in hot tropical and sub-tropical climates, aphids usually reproduce by thelytokous parthenogenesis, resulting in fast population growth. Besides, aphid populations entail overlapping generations, parental groups, as well as their older descendants contribute to population increase [. One way to measure the potential population growth of an aphid species is via life tables.

These constitute crucial tools to comprehend population dynamics, estimate the insects' potential and reproductive growth parameters(William 2020)(Fig.03)(Fig.04)

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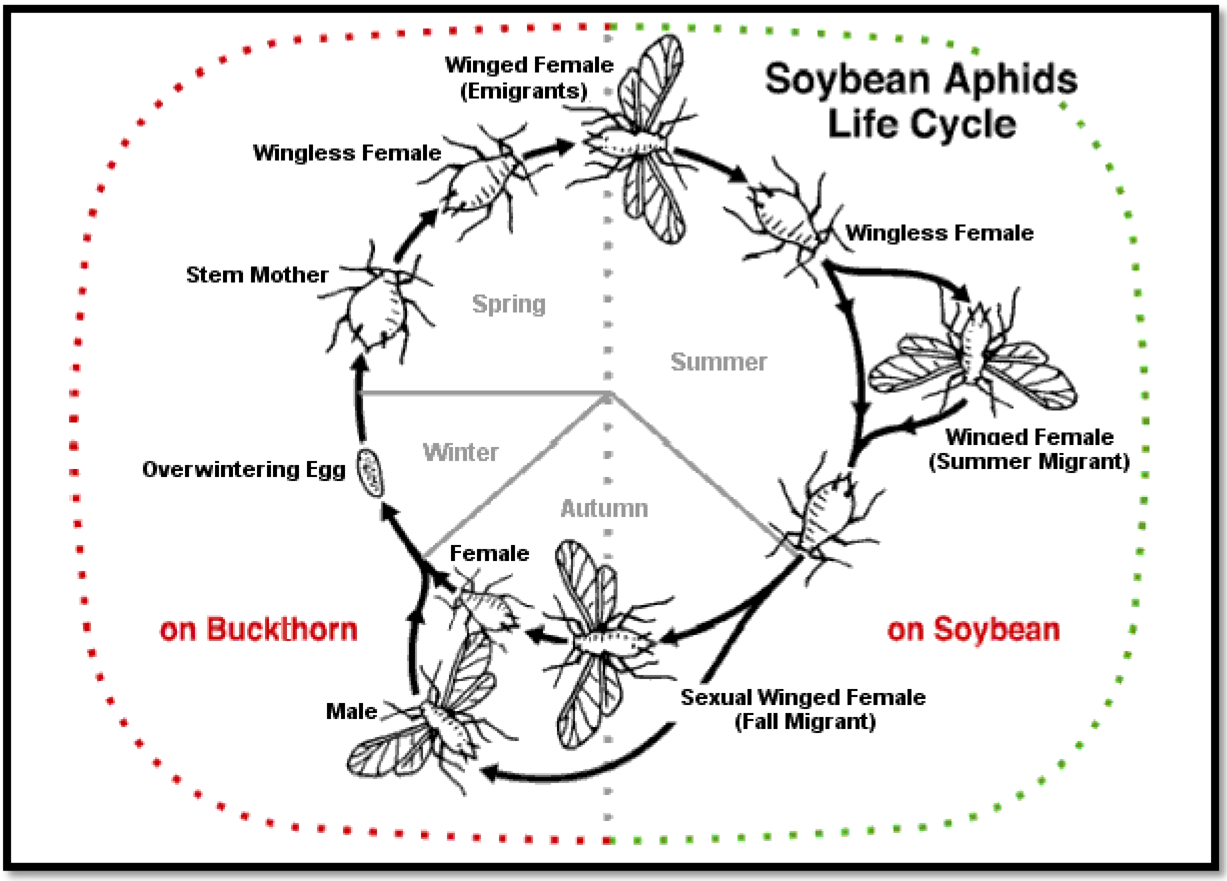
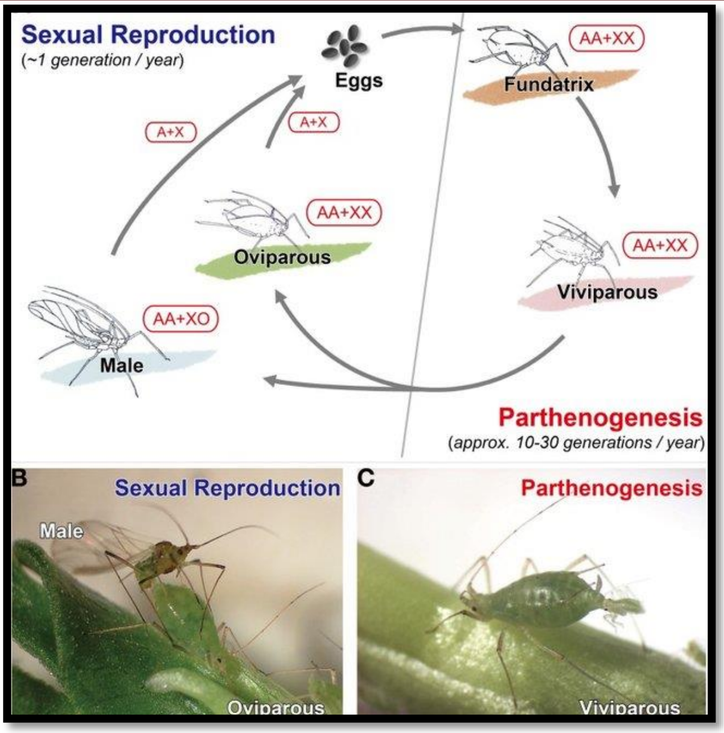


Fig. 03- Life cycle of the soybean aphid(William 2020)



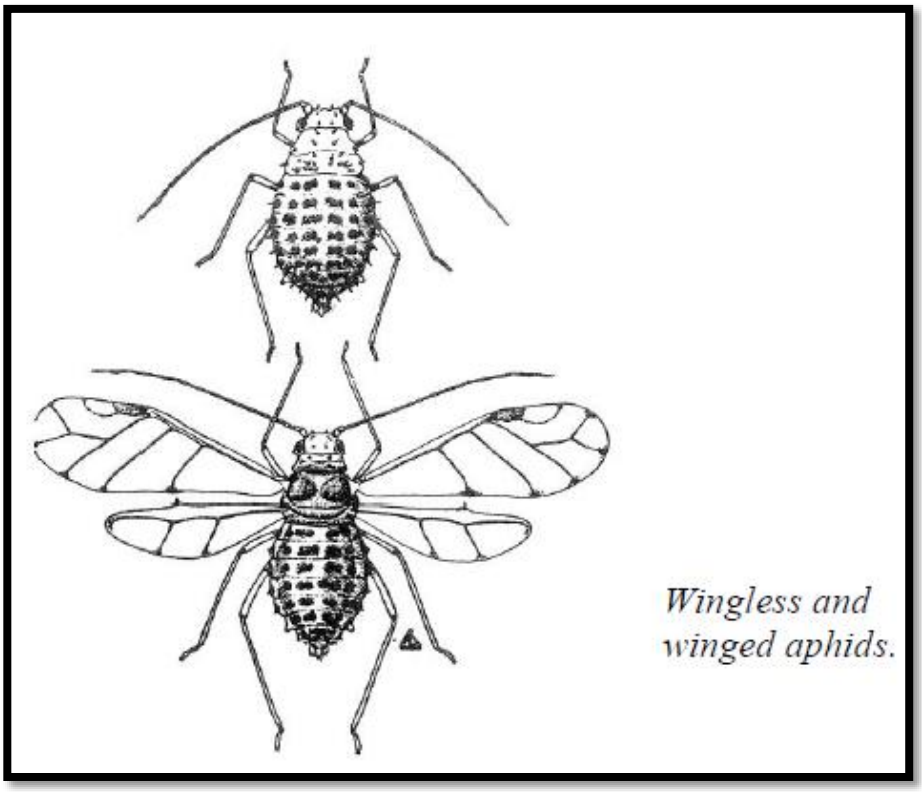


Fig. 04- Reproduction process

7- Anatomy

Four winged selectorized with thick anterior margin and light anal margin hindwings considerably smaller than forewings sometimes transform into halteres head hypognathous frontal sclerite not. Lobes of the anterior division of clypeus not segmented. In winged forms mesothorax well developed. Legs long and of running type. The abdominal end usually with siphunculi. The ninth tergum often has a small "tail", or cauda. The body often with wax glands. Antennae three to six segmented with rhinaria.

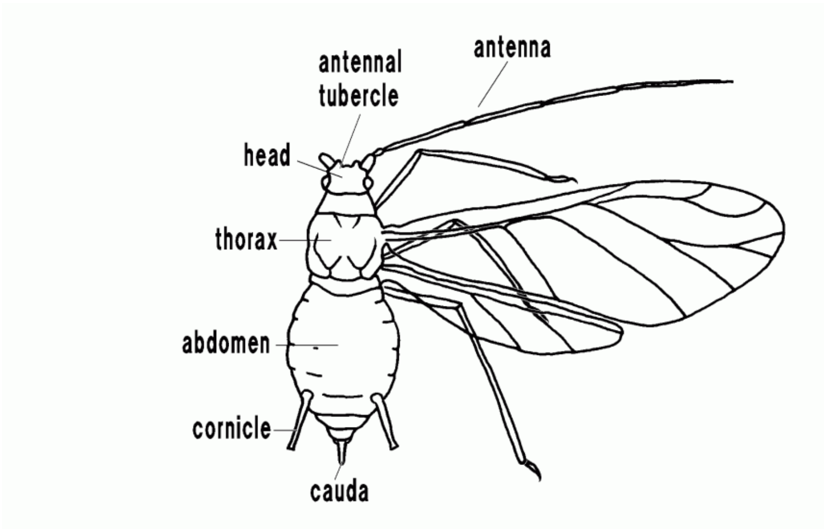


Fig. 05- External morphology of Aphid

Upper Permian to Recent. Five families: Permaphidopseidae, Pincombeidae, Genaphididae, Phylloxeridae, Aphididae.[1] The most typical organ of aphids is their piercing-sucking mouthparts called stylets. They have soft bodies, long, thin legs, two-jointed, two-clawed tarsi, and usually a pair of abdominal tubes through which a waxy secretion is exuded. These tubes were formerly supposed to secrete the sweet substance known as " honeydew" so much sought after by ants, but this is now known to come from the alimentary canal.

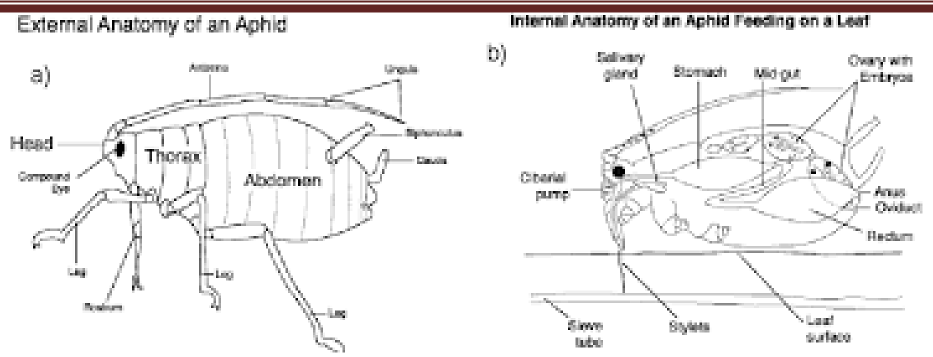


Fig. 06 External and internal aphid anatomy

Both winged and wingless forms of both sexes occur; the wings when present are two pairs, lacy, transparent, and only have one prominent longitudinal vein. Aphids also have a proboscis originating between and behind the forelegs. Aphids' antennae are composed of two thick basal segments and a flagellum with as many as four segments. The last of these four segments is divided into a proximal part and a thinner distal part (called process terminates).

Aphids have two compound eyes and two ocular tubercles made up of three lenses, each of which is located behind and above the compound eyes. They have two tarsal segments. The fifth abdominal segment bears a pair of tubes on the dorsal surface named siphunculi (cornicles), which are upright and point backward. A cauda is usually present below and between them on the last abdominal segment(B.BAHNHORF 2016)

Aphids are phloem feeders that occasionally ingest xylem sap, Sucrose and amino acids are the main nutrients influencing the biological performance of aphids, To acquire these nutrients, aphids insert their stylets into the plant tissue up to the sieve elements of phloem, where they feed on the sap. Aphids also consume xylem sap, which has a different and more diluted composition relative to phloem sap Contrary to phloem sap, which is under positive pressure, the content of a xylem vessel is under large negative pressure, necessitating active pumping by the aphid to imbibe xylem sap during the day. The large amount of effort required to ingest xylem sap (Malone et al., 1999) suggests that aphids benefit from xylem sap ingestion. The watery diet that represents xylem sap is thought to constitute only a source of water to aphids that are dehydrated following a starvation period a period of starvation lasting 14–24 h, apterous Aphis fabae, Rhopalosiphum padi, Metopolophium rhodium, and Sitobion fragariae increased the time spent ingesting xylem. Such a long period of starvation is unusual for apterous aphids but occurs after the final ecdysis for alate aphids (Kobayashi and Ishikawa, 1993; Tosh et al., 2002). The weight lost during that starvation period, partly due to water loss, facilitates subsequent flight to a new host-plant presumably by reducing wing loading, Alate adults can subsequently compensate for their water deficit by consuming xylem sap after alighting on a new plant(Julien Pompon).

8- Ecology

- Aphids evolved feeding on trees but diversified to colonize herbaceous plants, Three factors enable aphids to multiply quickly:

a- Parthenogenesis, where the development and growth of embryos occur without fertilization.

b- Viviparity, where embryos develop inside the mother and are born live,

c- Telescoping of generations, where a young aphid inside its mother's body already contains a developing embryo (Fig.07)

d- Aphid colonies (Fig. 08) on wild plants are usually small and short-lived. This may be due to competition and natural enemies, but aphids are also 'self-regulating', so when their population outstrips resources, reproduction slows and winged morphs are produced that migrate to find more suitable hosts, Many predators, pathogens, and parasitoids that kill their host) target aphids. Ladybirds, hoverfly larvae, and lacewing larvae are the dominant predators. Primary parasitoids lay eggs inside aphids and the larva eats the aphid from the inside, before pupating inside its mummified body. The primary larva may then be targeted by secondary parasitoids.

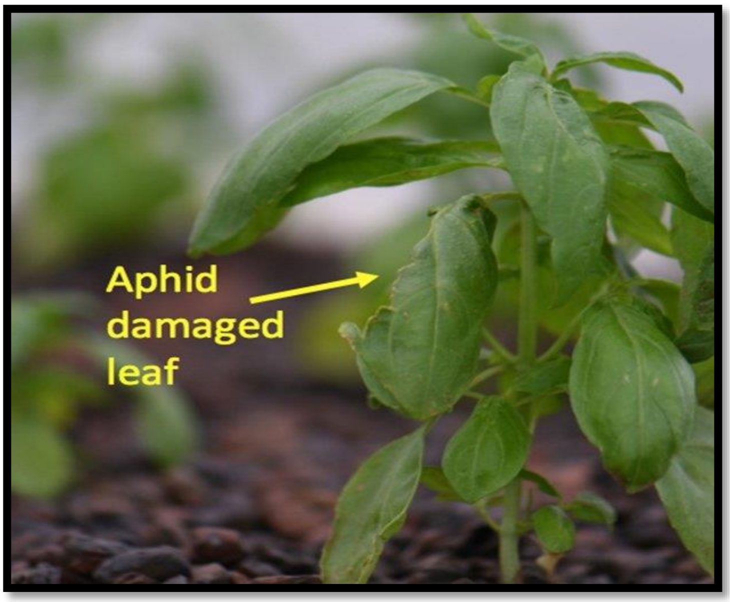


Fig. 07 Damage Aphid on leaf

Fig.08 : Damage caused by aphids on plants

8-1 Sociality

Aphids are among the few insect groups outside of the Hymenoptera that express advanced sociality. Sociality was first described in aphids in the mid-1970s (Aoki 1977). Almost all social species are found in dense clonal groups within galls on their host plants, and within these, specialized nymphal soldiers are produced that defend the clone from enemies. Their discovery attested to both the central importance of kin selection in social evolution as well as the decisive roles played by ecological factors, such as predation and cooperative "fortress defense" (Queller and Strassmann 1998; Kutsusake et al. 2004). Recent work in my lab has suggested an important role for intraspecific competition and conflict in aphid sociality. Current and future work build on these discoveries, The final determination of soldier differentiation occurred postnatally, probably at a late 1st instar stage. Direct contact stimuli from live non-soldier aphids mediated the density effect. While coexisting non-soldiers facilitated soldier differentiation in 1st instar nymphs, coexisting soldiers acted to suppress such differentiation, For evolution and maintenance of the social systems of insect colonies[1]

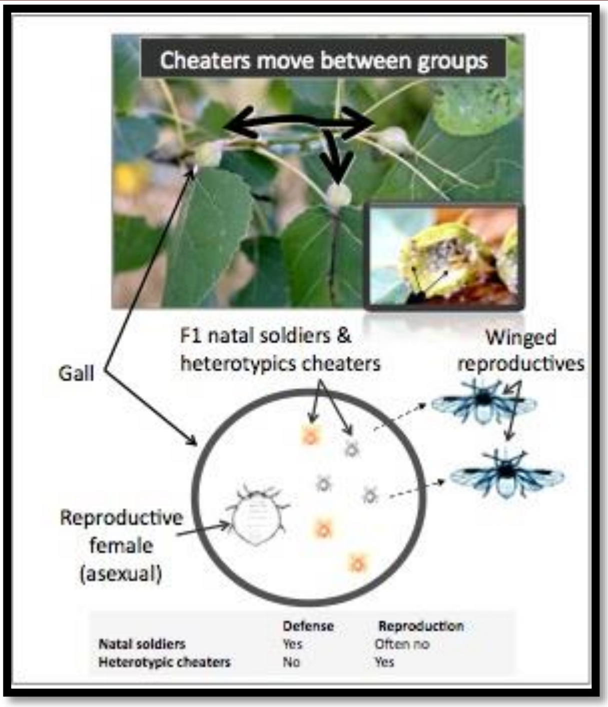


Fig. 08 Aphids and Thier off-sbring, sociality and social system

8-2 Plant and aphides interactions

Many aphids are major agricultural pests because of their unparalleled reproductive capacity and their ability to manipulate host plant physiology. Aphid population growth and its impact on plant fitness are strongly influenced by interactions with other organisms [1] Incompatible plant–aphid interactions aphids feed on sieve tube elements in the phloem using specialized mouthparts, called stylets, to obtain nutrients essential for survival and reproduction. However, aphids will attempt to penetrate the leaf surface using their stylets regardless of the plant species[2], Aphids are specialized phloem sap feeders that insert their needle-like stylets in the plant tissue avoiding/counteracting the different plant defenses and withdrawing large quantities of phloem sap while keeping the phloem cells alive. The high pressure within sieve tubes helps in passive feeding (Goggin, 1999).

9- Aphides in Alegria

Little is known about the aphid fauna of Algeria, with only 57 species of aphid recorded as present to date. This study, involving a literature survey and 14 years of trapping and host plant prospecting, extends the number of known Algerian aphid species to 120. Sixty-three of these species were recorded for the first time in this country, and 27 were recorded for the first time in the Maghreb region of North Africa. The aphid fauna of Algeria includes a large number of cosmopolitan species (42.1%) and no endemic species. It is very similar to the European aphid fauna and very different from the Sub-Saharan aphid fauna, despite the geographical proximity of this region. Most (68.3%) of the species identified are crop pests. This composition biased towards species with a broad geographical distribution that generally act as crop pests probably reflect the current lack of knowledge about this fauna. Future studies should lead to an increase in the number of species identified as present in this country, probably resulting in a change in the general characteristics of this fauna(Malik Laamari 2010) (Fig. 09)

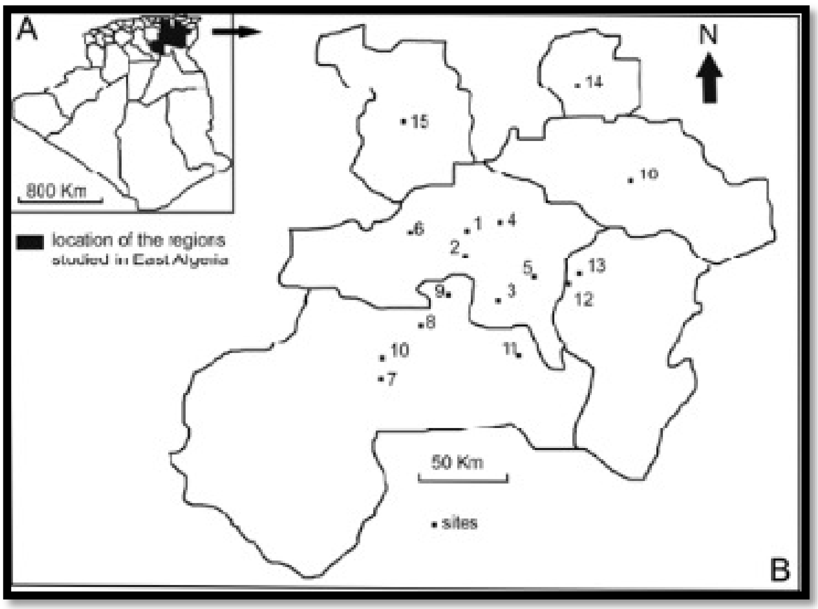


Fig. 09 Général distribution of aphides in Algeria

10- Aphids in Biskra the région of the study

Aphids are one of the major problems limiting yield in field crops. They not only weaken the plant by removing the sap but they also cause deformations of the plant and are vectors of several viruses (Dixon, 1998). In Algeria, the main pests of cereals are aphids, In a cereal ecosystem and to determine aphids and their natural enemies, tow trapping methods were used to help us identify 18 species of aphids, according to the results of several authors 05 of them are specific to cereals which are Rhopalosiphum padi, Rhopalosiphum maidis, Metopolophium rhodium, Sitobion fragariae and Sitobion avenae (Kellil, 2010; Assabah, 2011; Belbaldi and Guellal, 2017; Khetfi, 2018). Givovich and Niemeyer (1994) report that R. padi, R. maidis, and M. euphorbiae are very common cereal species. knowing that, Biskra is a semi-arid region where the average temperature varies between 11.8 C°() Nour-Elhouda Bakroune, 2000)

Chapter 2

Generality on *Artimisia herba alba*

1. Générality

The genus Artemisia belongs to the family Asteraceae (Composites), with more 350 different species found mainly in arid and semi-arid zones arid Europe, America, North Africa, and Asia. Artemisia species are widely used as medicinal plants in traditional medicine, White sagebrush is a plant of arid and semi-arid climates that grows in the high steppe plains, the deserts of the Middle East and North Africa. (Fig. 10)

Fig. 10 *Artemisia herba alba*

2. Taxonomy

Artemisia is the genus name of the sagebrush, it comes from that of the Greek goddess of lachasse Artemis; herba-alba means white grass (Messai 2011). And its scientific name is Artemisia herba-alba Asso or artimisia incutidal ,[1]

2- Geographical distribution in Algeria

The genus Artemisia includes a variable number of species (200-400) found in the northern part of the world. (Salido et al, 2004). Sagebrush, a white grass, is widely distributed from the Canary Islands and south-eastern Spain to the steppes of Central Asia (Iran, Turkmenistan,Uzbekistan) and North Africa, Arabia, and the Middle East, In North Africa, this species covers vast territories valued at more than 10 million of hectares, its repair area is limited in the high Algerian-Moroccan steppe plains, in Tunisia and Central Sahara, In Algeria, the area occupied by this species varies according to the authors. According to Those (1980) in Ayad et al (2007), the white sagebrush has a vast geographical distribution covering about 4 million hectares. The white sagebrush steppes, by their extent, their homogeneity, and their pastoral interest, constitute the present facies of the Southern Oran were covering nearly 30% of the rangelands. (Nedjraoui, 2004) (Fig. 11)

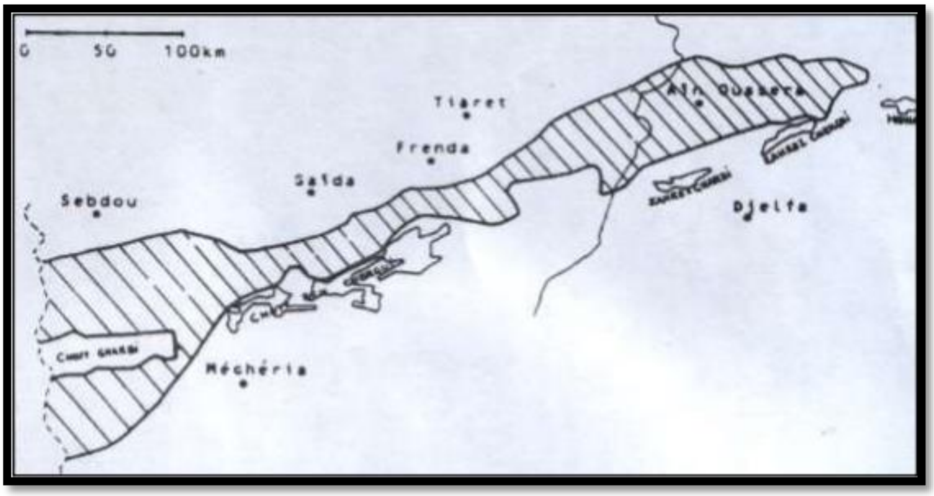


Fig. 11 Distribution of artimisia alba in Algeria

3- Phytogepgraphy

The White Sagebrush (Artemisia herba alba Asso), a steppic species of the Asteraceae family, meets from the Iberian Peninsula and the Maghreb to Afghanistan. In Algeria, the potential area of the white sagebrush steppes is estimated at three million hectares which spread across the upper and middle arid stages in cool and cold winter with precipitation ranging from 100 to 300 mm. The work of the phytoecological inventory of the white sagebrush formations has been carried out throughout steppic Algeria (Celles, 1975; Djebaïli, 1978). In general, these steppes are considered to be derived from alfa steppes by degradation. The work is a contribution to the knowledge of the dynamics of the white sagebrush steppes (Artemisia herba-alba Asso.) of Eastern Algeria, including the wilayat of M'sila, Batna, Biskra and Tebessa (Fig. 12)

Fig. 12 Global distribution of *Artimisia herba alba*

04- Ecology

The genus Artemisia L. (family Asteraceae, tribe Anthemideae), comprises a variable number of species(from 200 to over 400, depending on the authors) found throughout the northern half of the world. The genus may be divided into sections Artemisia and Dracunculus The genus Artemisia is known to contain many bioactive compounds; artemisinin exerts not only antimalarial activity but also profound cytotoxicity against tumor cells(Abou El-Hamd 2010)[1]

5- Botanical description

A. herba-alba is a greenish-silver perennial herb that grows 20-40 cm in height; it is a chamaephyte (i.e. the buds giving rise to new growth each year are borne close to the ground). The stems are rigid and erect. The grey leaves of sterile shoots are petiolate, ovate to orbicular in outline whereas the leaves of flowering stems are much smaller. The flowering heads are sessile, oblong, and tapering at the base. The plants flower from September to December. Plants are oblong and tapering at the base. Plants are found on the steppes of the Middle East and North Africa where they are common and sometimes stand-forming(Abou El-Hamd 2010)[2]

6 - Phenology and adaptation

While phenology data (the timing of recurring biological events) has been used to explain and predict patterns related to global change, and to address applied environmental issues, it has not been identified as pertinent for restoration Anthropogenic landscapes are associated with biodiversity loss and large shifts in species composition and traits. These changes predict the identities of winners and losers of future global change, and also reveal which environmental variables drive a taxon's response to land-use change, Under ideal treatment and moderate stress, Artemisia herba alba spends eight months in the vegetative growth. It begins in August and lasts until March. However, this phase begins after two months during the regime of severe stress , so generally, their adaptation future is highlly dependent on their phenology (artimisia herba alba)(Elise Buisson 2016)

7-_Utilisation of artimisia alba

L'Artemisia herba alba est très utilisé en médecine traditionnelle lors d'un désordre gastrique tel que la diarrhée et les douleurs abdominales. Elle est aussi utilisée en tant que remède de l'inflammation du tractus gastro-intestinal Plusieurs études scientifiques ont également prouvées l'efficacité de l'armoise blanche en tant qu'agent antidiabétique leshmanicide antiparasitaire, antibactérien, antiviral, antioxydant, antimalarien, antipyrétique, antispasmodique et antihémorragique

7-1 In traditionel medicine

Many medicinal plants contain large amounts of antioxidant compounds, which could be isolated and then used as antioxidants for the prevention and treatment of free radical-related disorders. In a study by Djeridane, the purpose was the evaluation by a chemical method of the antioxidant capacity of phenolic compounds in some Algerian medicinal plants, including A. herba-alba. These medicinal plants showed stronger antioxidant activity and content in phenolics than the common nutritional plants. It has been also noted in this study that these Algerian plants are strong radical scavengers and can be considered as good sources of natural antioxidants for medicinal and commercial uses, that Artemisia it has increased the total antioxidant status, whole blood glutathione peroxidase activity and zinc and copper status, and prevented weight gains and increased conjugated dienes, plasma glucose, lipids, and iron status(Abou El-Hamd H 2010)

7-2 In Phytoprotection

Some plants are known for their ability to synthesize secondary metabolites with insecticidal properties. These metabolites can be used in the control of insect pests or vectors of infectious agents, the insecticidal properties of an Algerian spontaneous plant collected from the Algerian Sahara, it has an inhibitory effect of embryogenesis for the eggs and good insecticidal activity on the larvae, the finding of some research reflects the excellent insecticidal effect of the test extract, the possibility of using the secondary metabolites of Artemisia as bio-insecticide are encouraging(Fatma Acheuk 2017)[1]

8- Morphological aspect

White sagebrush, is a sub-shrub (bushy), xerophytic "living in a dry environment " (Ramendo, 1980), chamephyte but often become hemicryptophyte by grazing (Negro,1962), It generally grows in small, fragmented clumps in areas accessible to herds (Aidoud 1984), The general morphology of the sagebrush tuft depends mainly on the environment and especially the intensity of its exploitation through grazing. When it is little grazed, it well-developed round tuft with a height of about 25-30 cm and a diameteraverage of 30 to 40 cm. The height as well as the diameter can reach and even exceed 50cm when the plant is on deep depression soil and well-watered or on a slope(Aidoud, 1988)[2]

8-1 Stems (tige)

The stem can be defined as a generally aerial axis, extending the root, including the main stem and secondary stems with lateral extensions: twigs and leaves.(Deysson, 1976) White sagebrush has a very branched main stem that extends through many rods are becoming thinner and thinner; each rod is distinguished by a size ranging from 30 to 50 cm(Bendahou, 1991), beige, very leafy with a thick strain (ABDERRABI Khadidja 2018) [3]

8-2 Roots

The root can be defined as an organ whose role is to fix the plant to the soil and absorb water and mineral salts (Deysson 1976).

White sagebrush has a thick, woody root that is distinct from secondary roots, which sink into the soil as a pivot. The root system has a shallow extension with a large number of lateral branches especially abundant between 2 and 5 cm deep relating this root form to the existence of a superficial limestone crust. When the Chih (Artemisia herba- alba Asso) grows in a etter region, its roots penetrate deeply to 40-50 cm and branch only at this depth (Pourrat,1974).

8-3 Leaves

The leaves are lateral expansions of the stem or its branches. They are almost always green and it is mainly at their level that assimilation occurs chlorophyll and gas exchange with the external environment (Deysson 1976).The leaves of the white sagebrush "Artemisia herba-alba Asso", are white, woolly, canescent, short, usually silvery pubescent, and pinnatipartite (Quezel and Santa 1963; Ozenda 1991). They are very polymorphic, deeply bipennatised, silver grey, tomentose (Aidoud, 1988). According to Nègre (1962), the lower leaves are petiolate

8-4 Flower heads and flowers

The flowers are clustered in clusters with very small (1-1.5 mm) flower heads (Pottier 1981), and ovoid to involucre scarlet containing only 3-8 flowers, all hermaphrodites and receptacle on the burning corolla, obliquely; on the ovary the flower head is sessile (Quezel and Santa 1963).

These pacifier capitulas, generally homogeneous are inserted directly on the axis and without any support (Ozenda, 1985).

The gamoptal corolla comes from the welding of petals and stamens. Its yellow flowers are tiny (Mahmoudi 1991).

8-5 The seeds

The fruit is an achene with lateral perianth, oblong, glabrous and smooth (Negro,1962). The size of the seeds does not exceed 0.3 mm. In contact with water the seed develops a mucilaginous mass that allows it to settle in the soil (Kaul and Al-Mufti, 1974 in Lahmar, 2001) (Fig.13)

Fig. 13 Illustration of the different morphological aspects of Artemisia herba- alba Asso

Chapter 3

Matérial and methods

1- Artemisia alba alba description

- The plant tested was harvested from the ain zatout biskra area in Décembre 2019. The plant has been dried in the shade in a dry place and aerated at an ambient temperature of 25°C during two weeks, The dried plant is crushed by a hand grinder , to reduce the powdered plant that has been passed then on a sieve with a 0.5 mm mesh of diameter, to obtain a fine powder and grain size homogeneous. The powder was stored in hermetically sealed glass bottles of light and moisture.

Fig. 14 Artimisia herba alba plantation, Station 1

Fig. 15 Artimisia herba alba , Station 2

2 – Aphids study

- The Aphid insect were taken from the test fields of the Faculty of Agronomic Science of the University of biskra. Incubation of the eggs and rearing of the different larval stages were carried out at the laboratory level at a temperature of 28-30°C and discontinuous lighting in plastic bins
-

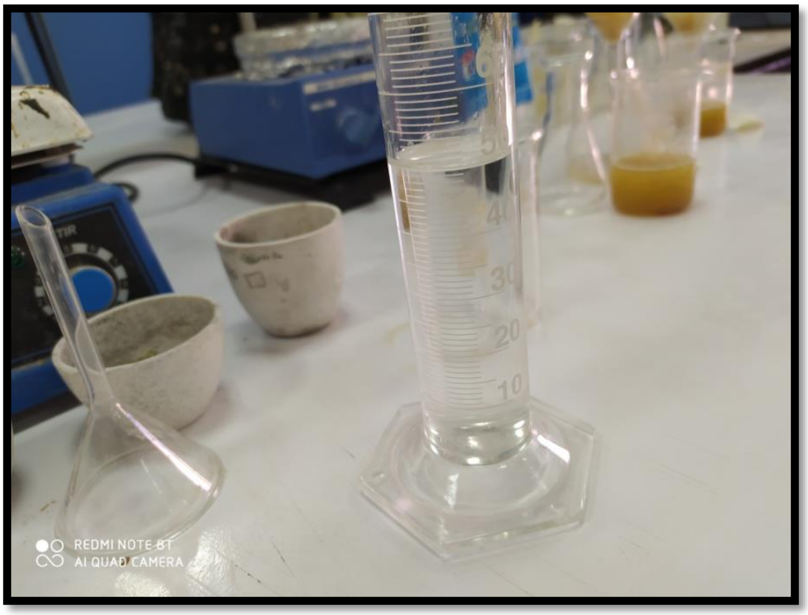
Fig 15 Tomate plantation under polycarbonate green house

Fig. 16 Installation of yellow trap under green house

Fig. 17 Tomato plantation under plastic green house

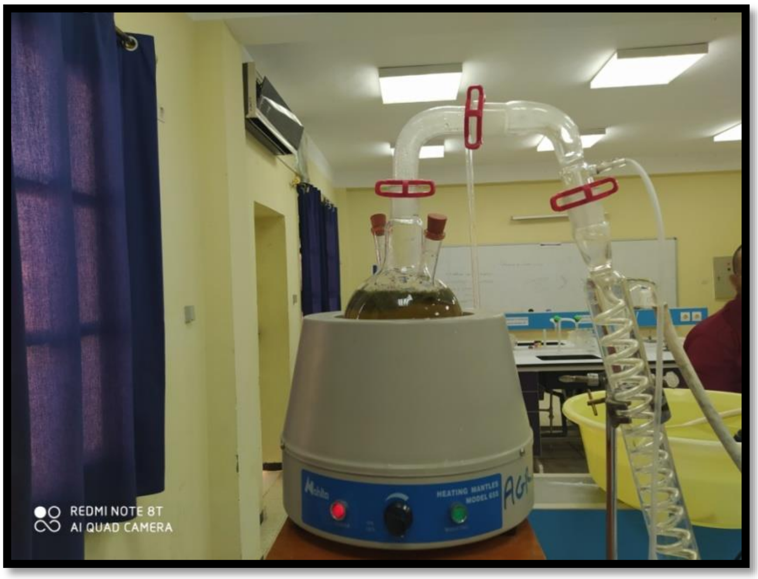
3- Preparation of pure ethanolic extract :

- An amount of 5 g of powder from the plant was left to macerate in 80 mL ethanol for 3 days under agitation. After filtration, the residue was extracted a second time with 40 mL ethanol for 48 hours and a third maceration was made with 20 mL ethanol for 24 hours. The extracts were then combined and filtered. The ethanolic extract was evaporated vacuum at 40°C. The raw extract was recovered in a glass pill box then dried until evaporation total ethanol



1- Ethanol liquide 70°

2- Poweder of artimisia alba



3- The methode of extraction utilisation of évaporateur

4- Utilisation of condenseur in extraction processus

Fig. 18 – Artimisia herba alba extract methods (1,2,3,4)

4-insecticidal activity :

4-1 ovicidal activity :

Three doses of crude extract of A. alba were tested on the eggs of the aphids.: 5; 7.5 and 10 g/L water. 20 mL of each of the three solutions are put in plastic cups. The trays are then placed on the surface of these solutions of extracts at the rate of a container by cup. For each dose, incubation takes place at temperature environment. Egg hatching is monitored and the number of dead larvae just after emergence is counted every 24 hours for 2 days. One test control was conducted using water without extract. All the tests were carried out in four repetitions.

4-2 Larvicid activity :

- Based on the results of the ovicides tests, a range of variable concentrations ranging from 0,31 to 5 g/L of water has been prepared. Larvicides tests were performed on the first three larval stages: L1, L2 and L3. A number of 20 larvae of the same stage and same age are collected using a pear pipette and are inserted into a cup containing 20 mL of each insecticide solution previously prepared. For the witness, the larvae were deposited in cups containing only 20 ml of water. Mortalities were calculated after an exposure time from 2h, 4h, 24h, and 48h. Four rehearsals have were performed for each dose tested Percentage of mortality observed for each replicate in control and treated larvae has been calculated according to the following formula :

Mortalité taux=(nomber of death/total nomber)*100

Observed mortalities were corrected using of the Abbott formula (1925) taking into account natural mortalities observed in the control batches.

Mc = ((M2-M1)) ((1-M1))

With:

M1: percentage of mortality in the control lot.

M2: percentage of mortality in the treated lot.

Mc: corrected percent mortality.

The LD50 is calculated from the regression lines

probits =*f* (log dose)

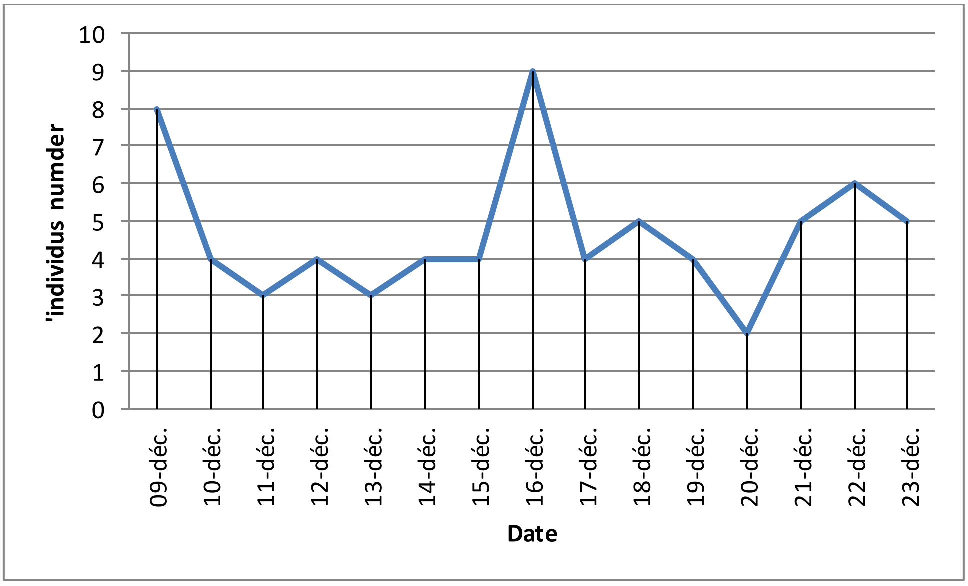
CHAPTER VI :

RESULTS AND DESCUSSION

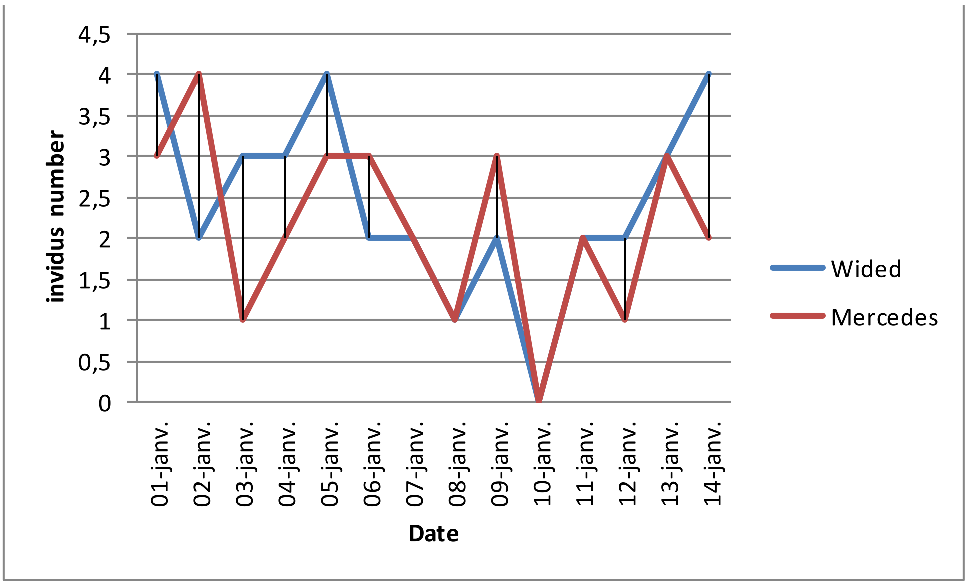
1- Population evolution of *Myzus persicae*

1-1 Evolution of the larvae

The mean numbers of larvae of Myzus persicae, a pest of greenhouse vegetable crops, are low during September and October. It is 4.11 ±0.40 individuals counted on tomato, zahra variety and 4.77±1.80 individuals counted on pepper, gazelle horn variety. The overall number of larvae becomes significant from mid-November 2013, i.e. 5.22 ± 1.59 individuals counted on tomato variety zahra and 16.11 ± 1.49 individuals counted on pepper variety gazelle horn.



Adult counts of Bemisia tabaci conducted during the two sampling periods, one spring and the other fall, at the University of Biskra station show that the numbers are high during the spring. In fact, the average of the highest adult population of *Bemisia tabaci* , 3.4± 1.43 individuals counted on chilli pepper planted under greenhouse, variety gazelle horn, on March 15, 2020. Whereas, the average of the lowest population size with 3.4±0.5 individuals, recorded on November 15, 2019



1- Effect of Artimisia herba alba extracts

A. alba crude extract tested on eggs of aphides at three different doses: 5; 7.5 and 10 g/L. The results obtained show that the extract of the tested plant has good activity ovicide. This action evolves with the increase doses of the extract tested: The highest dose tested (D3:10 g/L) completely inhibited the outbreak

- the two L1 larvae have emerged. The inhibitory effect is less pronounced for the average dose 7.5 g/L. For lowest dose (5 g/L), the extract had no effect on embryogenesis and hatching of eggs was total a lot of L1 larvae emerged and immediately killed by the extract

1.2- Larvicid effect of A. alba extract against aphid larves in stages

Results of the toxicity tests of the raw extract of A. alba made on the larvae of the first stage of newly emerged aphide show a dose-response relationship. Indeed high dose (D4: 5 g/L) resulted in 88.47% after two hours of exposure. 100% of mortality was obtained after four hours of exposure. The low dose tested did not result in 100% of mortality only after 96h. As with L1 larvae, an increase of the mortality percentage of treated L2 larvae a been noted with increased doses of the extract tested. 100% mortality is achieved after 24 h exposure for both high doses: D4 and D3 (1,25 and 2,5 g/L). showing the change in percentagescumulative mortality of L3 larvae as a function of time, shows that aphides larvae are sensitive to the extract tested. 100% mortality is observed 2 hours after treatment with dose D3:4 g/L

1.2.1- Evaluation de la DL50

Tracing the regression lines of the problems in function of logarithms of doses at different times The LD50 for different larval stages L1, L2 and L3 that are represented by Figures 6,7 and 8.These figures show that the toxic effect of the extract analyzed is clearly apparent through the values of the LD50 found. These values decrease in the time, which translates the good effectiveness of extracts tested. For L1 larvae, the highest LD50 was obtained after 2h of exposure and it is 2.4 g/L. The low LD50 value was 1.54 g/L, it was obtained after three days of exposure. For L2 larvae, the LD50 calculated after 2 hours exposure was 1.6 g/L. This result explains the high resistance of larvae L1 compared to larvae L2.The LD50 obtained after two hours of exposure for L3 is 2,28 g/L

In this study, an evaluation of the insecticide effect crude ethanolic extract of the aerial part plant A. alba known for its insecticide activity was carried out. The results of the of toxicity of the raw extract of the plant revealed a good ovicidal and larvicid effect with a dose- response. Indeed, at high doses, the extract inhibited completely hatching the eggs. On the larvae, a progression of mortality as a function of doses a were observed. 100% mortality was achieved after four (04) hours of exposure for L1 and the L3 and this with the highest dose. For the L2, the 100% mortality was achieved after 24 hours of exposure.The strong insecticidal power of this plant is

related to the richness of this plant in secondary metabolites against the aphide. However, extracts of A.alba revealed higher larvicid activity than that of other precedent prnementale plants . The differences in the effect biocide found from these tested extracts could be explained by their different chemical composition

Conclusion

Conclusion :

The limited effectiveness of conventional chemical control makes aphides very effective pests in the eyes of growers. In the absence of resistant varieties, aphides are among the most stealthy insect invaders because of their small size and cryptic habits and their location in the leaves. Many invasive aphides are known to cause significant damage to crops even at low population density, viral disease vectors wide variety of species decided which leads to a permanent destabilization due to eruptive epidemics that require correction with insecticides, leading to the development of resistance to insecticides. Several challenges arise when attempting to manage invasive thrips species , Studies on aphides are fragmentary and require further investigation, understanding of distribution parameters, host variety preferences, improved understanding of their bioecology from an integrated management perspective for our citrus orchards. The use of biotechnological means such as the creation of bio-insecticide allow a good understanding of the fluctuations of these pests by adapted monitoring conducted through all the phenological stages of the crops in the different areas for sustainable management of the latter. Also A better understanding of the diversity of the aphides and the search for new control solutions adapted and specific to each species are therefore at the heart of the reflections for an improvement of the effectiveness in the fight against aphides .

Aphides are difficult-to-control pests but several techniques tested have yielded satisfactory or promising results the devolpement of an extract that is based on the artimisa herba alba plant that we could use as a biological pesticide againset aphide the bio-pesticeds are the near future technology in the agriculture demaine in the emergence case of the corona virus pendamic we couldn’t complete our all expierement

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