



Management and Uses of Weeds in Andalusian Agricultural Treatises

Batul Al-Husein Raie

Department of Semitic Studies, Granada University, Granada, Spain

Email: balhuseinraie@gmail.com

How to cite this paper: Al-Husein Raie, B. (2022) Management and Uses of Weeds in Andalusian Agricultural Treatises. *Open Access Library Journal*, 9: e9033. <https://doi.org/10.4236/oalib.1109033>

Received: June 22, 2022

Accepted: August 30, 2022

Published: September 2, 2022

Copyright © 2022 by author(s) and Open Access Library Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Since the control of weeds has been a constant concern in agriculture, new methods and products are being developed to control them. Currently, we are looking for effective and minimally invasive methods to treat them with. Therefore, this article explores the methods used in the Andalusian period, in many cases derived from the Greco-Byzantine tradition and then further developed. In the Andalusian treatises there are hardly any chapters specifically dedicated to weed extermination, however, the subject is mentioned in different chapters. Sometimes the soil is fertilised to prevent the growth of weeds and sometimes they are simply pulled out by hand. Obviously, there are different ways of eliminating weeds, depending on their quantity and the place in which they are found. The results of this work may lead to treating ground and soil more naturally and less invasively by avoiding chemicals. To begin with, these ancient theories can be applied to and tested in small areas.

Subject Areas

Agricultural Science

Keywords

Weeds, Agricultural Treatises, Al-Andalus, Extermination, Benefits

1. Introduction

The development of intensive agriculture and the massive use of chemical compounds in recent years has led to a reduction or disappearance of many weeds, such as the corncockle (*Agrostemma githago*) or even, in some countries, the poppy (*Papaver rhoeas*). This decline in plant diversity has led some scientists to consider their conservation to prevent them from disappearing altogether. We may think that the total elimination of these species is a good thing, as they in-

vade and destroy crops, however strangely enough, weeds can be fundamental components in the functioning of agricultural ecosystems and provide a number of benefits to humans [1].

Let us start with an explanation of the concept of “weeds”. This term is very broad and much has been written about it. For example, González Andújar and Fernández Quintanilla find that J. L. King, in his book *Weeds of the World*, compiles 30 definitions and ideas about weeds; he defines them as plants that thrive in undesirable places, grow abundantly and spontaneously, have a high reproductive capacity, and are persistent and resistant to control measures, among other qualities. However, for those two authors the definition of weeds is anthropomorphic, and they say that “they are plants adapted to develop in habitats managed by humans and which, in a certain space and time, interfere with their objectives”. What this means is that these herbs are associated with places where humans carry out a certain activity (cultivation, roads, monuments...) and because of their growth they prevent them from carrying out that activity easily. Therefore, this concept serves to group together all plants that are capable of interfering with the objectives of certain people, while these plants are also a valuable resource for others, such as botanists [1].

With this last definition in mind, in the following pages we will see how, what are now considered weeds, in the Andalusian period had different uses. Moreover, the Andalusian agronomists rarely specify how to kill a specific plant, the most common way being to explain general methods of weed control, as will be seen later on.

The aim of this article, therefore, is to show a new perspective on weeds and new ways of exploiting supposedly noxious plants, based on Andalusian agronomic knowledge. This may lead to new methods of agricultural care in which fewer chemical compounds can be used.

In order to obtain the data that will be explained below, the editions and translations of the eight Andalusian agricultural treatises known to date were consulted, and an attempt was made to obtain all the relevant information on the methods of eradicating weeds and some of the uses of plants that are currently considered as such. The treatises consulted are the following: *Kitāb fī Tartīb awqāt al-gīrāsa wa-l-magrusāt: Un Tratado Agrícola Andalusí Anónimo* an anonymous Andalusian agricultural treatise later attributed to the Cordovan Ibn Abī l-Djāwād; *Maʿyūʿ fī l-filāḥa: Compendio de Agricultura*, by the 11th-century Toledo author Ibn Wāfid (erroneously included in the following agronomist’s treatise); *Al-Muqniʿ fī l-filāḥa: Lo que basta saber en torno a la agricultura*, by the Seville agronomist Ibn Ḥayyāy from the 11th century; *Kitāb al-Filāḥa: Libro De Agricultura*, by the Toledo-born Ibn Baṣṣāl from the 11th century; *Kitāb al-Filāḥa: Tratado de agricultura*, a work by the Seville-born Abū l-Khayr from the 11th-12th centuries; *Kitāb Zuhrat al-bustān wa-nuzhat al-aḥḥān: Esplendor Del Jardín Y Recreo De Las Mentas*, by the Granada agronomist al-Tighnārī from the 11th-12th centuries; *Kitāb al-Filāḥa: Libro de agricultura* by the Sevillian Ibn al-ʿAwwām from the 12th-13th centuries, and *Kitāb Ibdāʿ al-malāḥa wa-inḥāʿ al-raʿāḥa fī uṣūl*

ṣināʿat al-filāḥa: Libro del principio de la belleza y fin de la sabiduría que trata de los fundamentos del arte de la agricultura, an agricultural poem by Ibn Luyūn of Almería from the 14th century.

It has not been possible to obtain information of great interest from all of above; those who provide the most information were Ibn Wāfid, Ibn Baṣṣāl, Abū l-Khayr, al-Ṭighnārī, Ibn al-ʿAwwām and Ibn Luyūn. As for Ibn Ḥayyāy, he is quoted on many occasions, but always through Ibn al-ʿAwwām, who collects his indications regarding the subject in question, this part of his work having been lost in the present day.

The techniques used by the Andalusians are compared with some of today's techniques in order to see how much agriculture has developed and thus to draw conclusions.

Brief Biography of the Cited Authors

Ibn Wāfid was born in Toledo and was a physician, pharmacologist and agronomist. According to Ibn al-Abbār, he travelled to Córdoba where he acquired extensive training in the tradition of Greek medicine, based mainly on the treatise of Dioscorides and the works of Galen, among other authors. In his Compendium of Agriculture, he closely follows the work of the Byzantine agronomist Vindanius Anatolius of Berito (4th-5th century).

Ibn Ḥayyāy, born and died in Seville, was an agronomist, politician and writer. He was a member of one of the most important Sevillian families of Arab origin, the Banū Ḥayyāy, and therefore possessed a solid cultural background. The agronomist Ibn al-ʿAwwām praises his profound theoretical and practical knowledge of agronomy, as well as his work in transmitting the knowledge of the classical authors in this field, but only a few fragments of his work have survived.

Ibn Baṣṣāl was born in Toledo, likely of humble origins. His youth was spent in the taifa of Toledo where he began to frequent intellectual circles under the tutelage and direction of Ibn Wāfid, later moving to the taifa of Seville. Due to his knowledge and introduction of new species to the Iberian Peninsula, he is considered the master of the so-called "Andalusian agronomic school". As for his work, it is written on the basis of his own experience in agriculture, *i.e.*, he does not quote any author, contrary to the rest of the works consulted.

Abū l-Khayr was born in Seville and excelled in both agronomy and botany. In fact, the agronomist Ibn al-ʿAwwām gives him an important place in his work thanks to his profound knowledge of the different species and varieties of plants that inhabited al-Andalus and other countries. What has come down to us from his agricultural work does not follow a logical order, but it deals with the fundamental topics of this knowledge, and it combines the theoretical and practical aspects.

Al-Ṭighnārī was born in Granada. He was an Andalusian agronomist, physician and writer. His work has not been preserved in its entirety, but it is of great interest because it is one of the most systematic works written in al-Andalus, and adds dietary and pharmacological information on many plants, which is unusual

in this type of treatise. Despite citing a wide variety of classical and eastern Arabic sources, al-Ṭighnārī displays in his work his practical knowledge of the subject and faithfully sketches the surrounding landscape.

Ibn ‘Awwām was born in Seville. Virtually nothing is known of his life, but it is thought that he may have belonged to a prominent Sevillian family, as his scientific training was very broad. In his encyclopaedic work, he compiled practically everything that had been said about agronomy, both by classical authors and by the Andalusians who had dealt with this subject before him, as well as contributing his own experience in Seville. This work was for a long time the only reference on Andalusian agronomy, as he is the only Andalusian agronomist mentioned by Ibn Khaldūn in his *Muqaddima* written in the 14th century, as well as in the encyclopaedia of al-Qalqashandī in the 15th century. It was also the first treatise on Andalusian agriculture edited, translated and published in Spanish by Banqueri in 1802, then in French in 1864/7 by Clément-Mullet and even in Urdu as early as 1927 [2].

Ibn Luyūn was born and died in Almería and was a polygraph, ascetic, jurist and poet. His best-known work is his treatise on agriculture, written in the form of a poem, in which he summarises the Andalusian contributions to agronomy, especially those of Ibn Baṣṣāl and al-Ṭighnārī. Of particular interest is his last chapter in which he discusses how to arrange the buildings and crops on a farm.

2. Extermination of weeds in Andalusian Agricultural Treatises

Most of the Andalusian agricultural treatises speak in a general way about methods of eliminating weeds that damage the crop, but this information is very scattered, and we find it mentioned in chapters dedicated to pests, ways of preventing the fall of fruits, types of soil and their cultivation, the cultivation and care of different plants, etc.

In the treatises consulted, the authors rarely specify the type of weeds to be exterminated, but rather speak of general methods to eliminate harmful plants; moreover, the explanation given is often only that of weeding the weeds. An example is Ibn al-‘Awwām’s quotation from the Nabataean Agriculture (a 10th-century encyclopaedic work containing Mesopotamian agricultural knowledge) and the work of Ibn Ḥadjdjādī in which he states:

“According to *Nabataean Agriculture*, when the wheat begins to glean, it should be weeded of the grass that has been born, gathering it and throwing it away from there because it is very useful for the sowing, when the grass born between the bushes of wheat and barley is removed, its grains grow more robust and fatter. Anatiolius quoted in the book of Ibn Ḥadjdjādī says, that especially weeding should be done when the time of harvesting the ear approaches, which is very beneficial for the cleanliness of the grain; also, because the land that is only occupied in growing the grain sown in it, gives the most abundant harvest because of the nutrients it has [3].”

Having read the surviving Andalusian treatises, the following methods of extermination can be distinguished: elimination of weeds by means of different agricultural works; extermination by means of insolation; elimination of weeds by means of manure and by planting a greater number of seeds and, finally, by means of magical-superstitious acts.

Tilling the soil has been and still is one of the fundamental methods of weed control. Currently, three types of tillage are distinguished: primary tillage (initial work to break up and prepare the soil), secondary tillage (complementary work carried out to refine and level the soil before sowing the crop) and inter-row tillage (carried out when the crop is sown) [1]. These same tillage operations are specified in Andalusian agricultural treatises; for example, Ibn Luyūn mentions that ploughing in summer is beneficial because it pulls up weeds and, if repeated, prevents them from sprouting [4]:

“Good manuring, when it is lavished, kills the weeds and removes all harm. Ploughing during the summer is beneficial, because it pulls up any weed that you want to suppress, and the same applies to repeated ploughing, when you want to prevent unwanted weeds from sprouting [5].”

Likewise, the importance of this work is pointed out by Ibn al-‘Awwām:

“Ibn Baṣṣāl says that when such work is repeated in the earth several times, an excessive heat acts on it which exterminates its grass, its hardness softens, its pores widen, its fetid vapours are exhaled, its upper part mingles with the lower part, the sun penetrates to its centre, thins and warms it, it receives the rain that rests on it, its moisture and warmth grow, and this same prosperity also appears in everything that is sown: and so it is said, that this has for the seed which is sown in it the equivalent of the best manure compost crumbled and rotten in which no grass grows [3].”

As there are different types of land, some need more tillage than others. Ibn Baṣṣāl explains the same thing about red soil. This soil withstands a lot of water, but when it is left uncultivated, it grows grasses with good roots, such as thistles (*Sylibum marianum*). He states that whatever is sown without tillage and care does not thrive in this soil. However, if this soil is worked, whatever is sown in it thrives without fear of being destroyed by weeds and without the soil needing much manure [6].

As we have seen, turning over the soil is an important work, and for this reason the agricultural treatises specify the most appropriate time to carry it out. According to al-Ṭighnārī, the best land to cultivate is that which is turned over in January or February, turned over a second time in April and a third time in May, and then left for the summer heat to reach it, to remove any thistle, weeds or grass that grows in it [7]. Something similar is explained by Ibn al-‘Awwām who, unlike the previous author, does not mention the months but the seasons. He explains that it is beneficial for tired soil to be ploughed, and that it is advisable to plough it sometimes in the winter season until wide furrows are opened in it by the end of spring. With this continuous ploughing, the bushes are cut back

or uprooted. In summer, the heat of the sun penetrates deep into the furrows; this improves the porosity, sponginess and softness of the soil, preventing the weeds from feeding on it. On other occasions he mentions that, after this work, the soil is matted [3].

However, the ploughshare is not always used to remove weeds. Ibn Baṣṣāl explains that, for the cultivation of caraway, the hoes that are used must have a curved shape similar to the sickles used for mowing, but they must be stronger and larger; with them the soil is cleared of weeds and the soil is turned over two or three times [6].

Very interesting are the quotations in which the Andalusian agronomists specify very specific times to work the land, *i.e.*, they do not only mention the season of the year, but they also specify the sign in which the sun is. Thus we see that Ibn al-‘Awwām, quoting Yūniyūs (Vindanius Anatolius), advises to remove the bushes and grass by spreading them upwards to dry them. He specifies that this should be done in the month of July when the Sun is in Cancer and sixteen degrees from the Moon, making holes in the ground with the Sun in Capricorn. Once the grass is dry, it is also advisable to remove it from there, because in this way nothing will be left of it that can germinate [3], this same quote is explained in the *Nabataean Agriculture* specifying that the Moon must be waning [8]. Something similar is said by al-Ṭighnārī quoting Cassianus (Byzantine agronomist of the 6th century), when he affirms that whoever wants to maintain a vegetable garden should till the land in summer when the Sun is in Cancer, or till it in spring letting the herbs he has remain in it until the Sun reaches Cancer, to till it again in summer. He also points out that when the Sun arrives in the sign of Aquarius, there will be no more weeds to grow [7]. However, this quotation could not be found in either of the two consulted versions of Cassianus work [9] [10].

Another type of work mentioned for land clearing is shallow digging. This method is mostly used when it is a matter of inter-row ploughing in order not to damage the plant. Thus we find how Ibn Baṣṣāl specifies that, for the cultivation of the opium poppy (*Papaver somniferum*), it is left without watering when it has emerged, and in the month of January it is dug well to clear it of weeds. The same is explained by Ibn al-‘Awwām, but related to the cultivation of trees; thus, he states that in mid-March the soil is cleaned of the weeds that have grown next to it by means of shallow digging, and it is covered with soil [3].

On the other hand, Ibn Luyūn explains that the depth of the digging will depend on how strong the grass is, and he explains it as follows:

“Parasitic weeds should be pulled out in calm weather and when they are very overgrown, because weeding is difficult, especially in dense sowings. If the weeds are strong, the whole small hoe is put in, and if they are not, it is enough to put a little of it in [5].”

It is curious in the case of the rose bush because, in addition to making small digs with the small hoe, gloves must be used to clean it, when in the case of other

plants—even if they are also thorny—the Andalusian agronomists do not specify this [7].

Another method mentioned by the agronomists for the extermination of unwanted plants is weed burning. This way of killing weeds has also been used in recent years due to the demands of organic farming. This process consists of using burners placed under metal sheets containing propane gas. The heat generated by these burners breaks down the plant tissue of nearby plants, making it unlikely that the plants will be able to recover. These devices can be used to destroy all vegetation present in the field or for selective weed control within a crop [1].

Something similar was done in al-Andalus, but instead of using large machines, it was done by turning and burning the roots with the help of the sun. This is what Ibn ‘Awwām states in his treatise:

“I have read, says Ibn Ḥayyāy, in the books of some farmers that he who intends to make plantations should begin to till the soil diligently with three or four ploughings of deep furrows and close together, the more they are, the greater advantage and vigour they will give him, and that he should also cut down the couch grass, thorns, giant fennel and other such noxious plants, allowing the airs to thin and warm their particles, which if left a year for the variety of winds, the heat of the sun and of the summer to pass through it, will be much better [3].”

Ibn al-‘Awwām mentions that the ancients uprooted the harmful bushes with all their roots on hot days, for in this way all the bushes die and do not grow again. This can be done if the soil is thick, for if it is thin, it is not possible to do this in hot weather as the sun would scorch and corrupt it [3]. Ibn Wāfid mentions something similar, the only difference being that he specifies the use of the round hoe to cut weeds [11].

On the other hand, Ibn Luyūn does not elaborate much on the timing of removing weeds, but states that once the noxious weeds have been uprooted, they are taken out of the ground and burnt:

“Noxious weeds, such as those of oats, cumin, grass and the roots of sedge, once uprooted, must be removed from the plantation; the first two are destroyed by burning them, and the other two are annihilated by ploughing. The damage disappears completely if this is repeated several times [5].”

Al-Tighnārī explains the same process to kill the grass (*Cynodon dactylon*). He says that it has to cut with flat-sided ploughshare, and, once it has been pulled up, it is thrown out of the field for dunging. He states that the method of cutting grass is as follows, during the hot summer, its roots are removed and taken out of the earth in which they are located and burnt because, if they are left in the earth and humidity reaches it, it grows again [7].

The Andalusian agronomists used another way to warm the soil and that was by means of manure. Therefore, we find that manure is mentioned as another method to kill weeds, as long as the soil has been worked first. However, it is confirmed in the different treatises that farmers preferred ploughing the land to

manuring it, as spreading manure on a large piece of land was more laborious. Among the best manures for weed and worm control, ash is mentioned because of its warmth. This is followed by pigeon and sheep manure [3].

When al-Ṭighnārī discusses how to get rid of grass he lists manures that eliminate it, these being that of horse and donkey or ass. Moreover, he explains that there are two types of sedge (*Cyperus spp*), the one that germinates and the one that does not, and the former is the worst for the soil. To cut it down, the soil has to be ploughed in summer and fertilised with human manure mixed with pigeon manure. This manure is very strong and therefore it is advisable to use it sparingly [7].

Despite the examples given, great care must be taken in the use of manures, as they must be used on the right plant and after it has matured well, if they are used to work on the crop or serve to control weeds. One example is donkey manure: it is of good quality and is a good fertiliser for trees and plants, except for vines and olive trees, where its use should be avoided because it causes poor quality plants to grow at the base of them and damage them. Therefore, to apply it on these trees, it must be mixed with other manures [3]. As for the effect produced by unripe manures, a great example is sheep manure, Ibn Baṣṣāl explains that this manure is warm and moist, if it is used before it is well rotten, it causes a great multiplication of weeds, as sheep eat a lot of these, and their seeds are not altered in the stomach. On the other hand, if the manure is left to ripen and rot, the seeds of these weeds will die [6].

A curious method of eliminating weeds is to cultivate a greater number of seeds, as Ibn al-‘Awwām citing al-Ṭighnārī and Abū l-Khayr, among others, says that good quality land should be tilled early, from autumn onwards, especially if there are weeds in it, which are removed by cultivation. Therefore, on good land that tends to have a lot of weeds, more seeds should be put in, so that the soil is occupied in making it grow and forget to produce weeds. There is also good quality soil that grows fewer weeds, and this should be given fewer seeds, because even if it is given a small amount, its bushes grow and produce many shoots [3].

Likewise, we find plants that counteract others, as is the case with lupins. Ibn al-‘Awwām mentions that they are enemies of all trees and even of the hawthorn and its like. Lupins are also used to cleanse the soil of grass and other noxious plants in hot weather. The method is that once the lupins have hatched, they are pulled up by the roots and thrown over the harmful bushes, left to rot for twelve days, then manure is poured over them and the soil is turned over. In addition to lupins, we find that linseed and lentils are also used for the same purpose; thus, Ibn al-‘Awwām (drawing from *Nabataean Agriculture*) states:

“By scattering linseed on the ground where there are thistles, the flax that grows next to them will gradually weaken them because of the mutual aversion of these plants, which are never grown together in the same place, so that if one is sown after the one that was sown first is born, it causes the first to fade away [3].”

On the other hand, the same author mentions that if the lentils are sown together with the seeds, the bushes that corrupt them will not be born with them.

Finally, we find magical-superstitious methods, such as Ibn al-‘Awwām’s statement that noxious weeds, so that they do not grow again in the earth, should be pulled up in the waning moon, *i.e.*, in the last half of the lunar month [3]. Cassianus mentions the same but adding a few more facts:

“Other agronomists share the procedure of eradicating plants harmful to the field by cutting them with the crowbar, at the end of the lunar month, with a waning moon, on the eleventh of the month, at the beginning of Virgo, Capricorn, Aquarius, and also of a part of Leo [10].”

We come across more complex methods in which even blood is used. Thus, we see that al-Ṭighnārī, quoting Democritus (Greek agronomist of the 3rd century B.C.), says that if one takes a copper blade or sickle, heats it in fire and extinguishes it a few times in male goat’s blood, and then cuts with it the reeds, grass, thistles, brambles, reeds and other coarse weeds and plants harmful to the crop, they will never grow again [7]. This same process is explained in the *Nabataean Agriculture* [8]. Another procedure consists of taking a hoe or an adze, both made of brass and smearing it with the blood of a male goat, and by working with it any grass that is cut will never germinate again [11]. This same quotation is mentioned by Cassianus, but he specifies that it must be the blood of a small goat [10].

Ibn Wāfid also cites another process explained by Democritus, who states that a trick to remove weeds is to take five shreds of a new cloth and draw on each of them a man holding a lion by the mouth. Later, one shred is placed in the middle of the plantation and the other four around it, and with this all-noxious weed found in the plantation will die [11]. In the Cassianus *Geoponica* this same procedure appears referring to the removal of the dodder and specifies that the image of the man is that of Heracles [4] [9], however, in the Arabic version of Cassianus it is not specified that it is Heracles, and it is said that the drawing is made on pieces of new pottery [10].

A different procedure is to fix five oleander stakes, one in the middle of the field and the other four at the ends of the field, so that the crop will be protected from noxious plants [3].

3. Uses of “Weeds”

In this section we show the different uses given by Andalusian agronomists to some of the plants now considered weeds, which were believed to be useful for animals, plants and, of course, for people. Such was their importance that, in the treatises consulted, several chapters are devoted to explaining how they are cultivated, the type of soil that benefits them and when to fertilise them. This is the case of the thistle, orache (*Atriplex hortense*), pigweed (*Amaranthus spp*), mallow (*Malva sylvestris*), pursley (*Portulaca oleracea*), rocket (*Eruca sativa*), plantain (*Plantago lanceolata*), grass and henbane (*Hyoscyamus Niger*), among oth-

ers.

The main uses to which these plants were put are garden decoration, protection of some crops, and as food for people and animals. The latter should not be so strange since, nowadays, purslane, for example, is considered an edible weed, and is eaten in many places such as China, tropical countries and in Latin America, being very popular in the latter since the Spaniards brought it [1]. As for the animals, common and Egyptian grasses were cultivated because they served as pasture for the animals [3].

On the other hand, some of the “weeds” are cultivated for the delight of the eye, such as yellow horn poppy (*Glaucium flavum*) and thistle, which are grown in gardens for their beautiful appearance. According to Ibn al-‘Awwām yellow horn poppy is also cultivated for its medicinal uses:

“According to Abū l-Khayr and others...from its flower a cooling eye-drop is made for the eyes. The juice of its leaves is useful against erysipelas and burns by rubbing it on [3].”

Purslane was also used as a thirst remedy by placing its leaf under the tongue:

“According to Cassianus... if the thirsty person carries its leaf under his tongue it helps him to endure thirst [3].”

Al-Tighnārī mentions other medicinal uses of these herbs. Thus, he says that the orchard mallow is better to eat than the wild one, as the latter is bad for the stomach, softens the belly and makes the urine flow, but its stems are good for the intestines and the bladder. Also its leaves, if chewed, are useful for bumblebee stings. As a remedy for coughs and chest pains resulting from fever, it is good to eat noodles with purslane, pumpkin, orache or pigweed, which also serves as an antidote for blood spells. The same author mentions that the giant fennel (*Ferula communis*) heals *Burkholderia glumae* and makes urine and menstruation flow [7].

bn al-‘Awwām affirms that the cress (*Lepidium sativum*) is beneficial against the bites of harmful insects, if taken as a drink or applied as a cream on the bite. They can also be driven away if perfumed with it. In addition, he relates a different and curious use related to the black bryony (*Tamus communis*), saying that the stem of the plant was used by women to shave their faces [3].

As we mentioned at the beginning of the chapter, these plants had culinary uses, and therefore Ibn al-‘Awwām states that purslane, with pigweed and orache, are among the plants that can be eaten fifteen days after they have been cultivated. He also mentions that the flower of the rocket is used in some stews, and claims that must can be made from rocket seed, mustard and caper:

“Abū l-Khayr and others say, put sweet wort in a waterproof vessel, and taking mustard and rocket seed, or caper root bark, whatever of this you like, grind it very well and pass it through a sieve, and when the wort begins to boil sprinkle some of this in the middle of the boil, continuing to do the same whenever the boil is felt, for in this way its sweetness will be preserved and it will not make you drunk [3].”

Regarding the relationship of these herbs with the soil and cultivation, they helped the farmers to know the types of soil and which one was the most appropriate for the different crops. This is explained in almost all the Andalusian treatises on agriculture, and thus we see how al-Ṭighnārī says that the plants that grow in the soil indicate the type of the soil; thus, if we see that a soil is growing on a thistle or giant fennel, this indicates that the soil is of good quality [7]. Ibn al-‘Awwām (quoting Ibn Ḥaŷŷāŷ) says the same thing when he states that if bushes, hawthorns and other grasses grow robustly in the good quality soil [3].

Some of these plants are used to amend the soil and increase its quality of production. For example, Ibn al-‘Awwām argues, citing *Nabataean Agriculture*, that soil that is usually thin can be corrected with cow dung mixed with good soil, but it can also be fertilised by sowing it with legumes and short-rooted plants such as rocket and cress. As for very salty soil, it is usually improved by sowing it with slimy plants such as cotton, lupins, cress, etc. He also states, following Democritus, that soil in which caterpillars are sown twice is improved without the need for manure, and they also serve as fertiliser for wet soil [3].

In addition to the direct sowing of the plants, the most common practice was to mix different plants with manure to put it in the soil or crops, and thus the Sevillian agronomist explains, based on *Nabataean Agriculture*, that to correct the dryness of the soil, plantain, psyllium (*Plantago psyllium*), purslane, lettuce and other plants of a fresh nature were mixed with manure [3].

Weeds, although considered harmful to crops, were used in al-Andalus to strengthen and protect some cultivated plants, especially vines. Thus, we see that cucumbers, pumpkins and purslane used to be sown among the vines, as they are beneficial for the vine. Purslane was also used as a plant protector:

“As for the corrosion, which according to the *Nabataean Agriculture* happens to some plants on the branches that give on the ground, and whose mixture has a small degree of a salty not fetid smell and of dung, the remedy is to sow among them pumpkin, Armenian cucumbers, balaustria (flower of the pomegranate tree) and purslane, with which they recover from that corrosion [3].”

Rocket was also cultivated under the vines and allowed to grow its clumps as this helped the vines to withstand the cold of that year [3]. The same is explained by al-Ṭighnārī, but he adds to rocket Ethiopian cumin, and states that this way the vine does not suffer any harm. He adds that the ancients were agreed that the vine is strengthened if in its first year it is planted with flax, pigweed, purslane and cucumber [7]. In case the vine did not bear fruit, one of the solutions is to smear its vines with purslane juice [12].

On the other hand, we find an interesting relationship between the plantain and the pomegranate tree. Both al-Ṭighnārī and Ibn al-‘Awwām relate plantain to pomegranate remedies. They say that if the fruit of the pomegranate tree falls a lot, the roots of the plantain are taken and tie five of them on a thread, then hung on the branches of the pomegranate tree (four to five groups are placed on each branch), and this helps to prevent the pomegranates from falling [3] [7].

Another noxious weed cited by the agronomists is the white bryony (*Bryonia dioica*), but the root of this plant, ground and kneaded, accelerates the union in the graft [7]. Abū l-Khayr explains that red vine is used in graft union [12].

The crops also had to be protected from animals and insects that invaded or destroyed them, and for this purpose certain herbs were used, such as hawthorn, which was used to keep birds and other animals away from the trees. This was achieved by hanging a bunch of hawthorns from the tree so that, when the animals approached it, they would not harm it. Another method used was to boil white hellebore (*Veratrum album*) and henbane in water; barley was mixed in this water and then placed in the shade and exposed to the cranes and other birds: when they ate it, they became so drunk that they could be caught by hand [3]. Ibn Wāfid explains a similar process to kill bedbugs and fleas:

“Take *saykarān*, which is the henbane, both wet and dry, macerate it in water for a day and a night, mix it with vinegar, and water with it the parts of the house and the orchard where it is feared that there are fleas and bedbugs, and they will die [11].”

Some insects that are very common in crops are worms. When they attack the vine, a honey-like solution is made by mixing bitter apple, sun spurge (*Euphorbia helioscopia*) and squirting cucumber, all dried, and boiled with salt, vinegar and water. Another simpler way of repelling worms, reptiles, birds and other insects from the vineyard is to plant three or four bushes of spurge next to each vine [3].

4. Conclusions

As we have seen, weeds can be fundamental components in the functioning of agricultural ecosystems.

From the data we have extracted from these agricultural treatises, we notice that, in addition to citing agronomists from the period, they mention classical sources on several occasions. However, in addition to quoting their predecessors, the *andalusīs* added their own experiences, making each treatise a novel source of information by offering a wide variety of methods of weed control and use.

As we've seen, weeds can cause different types of damage to the crop, but also have its various benefits, as when combined with some horticultural plants. This clarifies how wrongly we consider many of the plants as weeds for cultivation, allowing us to combine these plants, such as vines with purslane or caterpillar, to reduce the use of chemicals and stimulate the production of a varied vegetation.

Clearly, it is not possible to make random combinations, as some plants would react harmfully with others, so we could say that each plant or crop needs a personalised treatment.

As far as culinary use is concerned, and as has been explained, it is not unusual nowadays, there are simply not many people who introduce these herbs into their diet, and because of this they are not cultivated either. Therefore, it

would be interesting to try to raise awareness in society that these plants are good food, as they bring different benefits to the body and have been used—both in the past and some of them nowadays—as remedies for different diseases.

Finally, there are many plants that are beautiful to look at, and for this reason they were cultivated for the delight of this sense. This could be another good way of preventing their extinction, by introducing them into private or public gardens.

Acknowledgements

This person is financed by the Junta de Andalucía.

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] González Andújar, J. and Fernández-Quintanilla, C. (2017) Las Malas Hierbas. CSIC, Madrid. <https://elibro.net/es/ereader/ugr/41892?page=11>
- [2] García Sanchez, E. (2009) Ibn Al-‘Awwām, Abū Zacariyya. In: Lirola Delgado, J. and Puertas Vilchez, J.M., Eds., *Biblioteca de Al-Andalus*, Fundación Ibn Tufayl de Estudios Árabes, Almería, 447-451.
- [3] Ibn Al-‘Awwām (1988) Libro de Agricultura. Preliminary study by García Sánchez, E. and Hernández Bermejo, J.E., Ministerio de Agricultura, Pesca y Alimentación, Madrid.
- [4] Carabaza Bravo, J.M. (2013) Técnicas de Exterminio de Plagas en los Tratados Agrícolas Andalusíes. Manuscrts. *Revista d’Història Moderna*, 31, 19-39. <https://doi.org/10.5565/rev/manuscrts.32>
- [5] Luyūn, I. (2014) Tratado de Agricultura. Universidad de Almería, Almería.
- [6] Baṣṣāl, I. (1995) Libro de Agricultura. Junta De Andalucía Sierra Nevada, Granada.
- [7] Al-Ṭignārī (2006) Kitāb Zuhrat Al-Bustān Wa-Nuzhat Al-Aḍḥān (Esplendor del Jardín y Recreo de las Mentes). Edited by García Sánchez, E., CSIC, Madrid.
- [8] Waḥshiyya, I. (1993-1995) Kitāb Al-Filāḥa Al-Nabaṭiyya. Edited by Fahd, al-Ma‘had al-‘Ilmī l-Faransī li-l-Dirāsāt al-‘Arabiyya, Dimashq. <https://archive.org/details/ibnwahshiyya/mode/2up>
- [9] Baso, C. (1998) Geopónica o Extractos de Agricultura de Casiano Baso. Ministerio de Agricultura, Pesca y Alimentación, Madrid.
- [10] Mariscal Linares, F.J. (2015) Edición, Traducción y Estudio del Kitāb Al-Filāḥa Al-Rūmiyya (Tratado de Agricultura Griega) de Qusṭūs b. Askūrāsīnah (Casiano Baso Escolástico). Ph. D. Thesis, Universidad de Las Palmas de Gran Canaria, Las Palmas. https://accedacris.ulpgc.es/bitstream/10553/17614/3/0724877_00000_0000.pdf
- [11] Carabaza Bravo, J.M. (1988) Aḥmad b. Muḥammad b. Ḥaḡḡāy Al-Iṣbīlī: Al-Muqni‘ fi l-Filāḥa: Introducción, estudio y traducción con glosario. Ph.D. Thesis, Universidad de Granada, Granada. <http://hdl.handle.net/10481/5929>
- [12] Abū l-Jayr (1991) Kitāb Al-Filāḥa: Tratado de Agricultura. Introduction, editing and translation by Carabaza J., Agencia Española de Cooperación Internacional, Madrid.