Received date: 18/10/2023 Accepted date: 05/11/2023 Publication date:15/12/2023

A Semi-Annual Peer-Revieed Scientific Journal –
Issued by the Faculty of Arts at Zawia University
Volume23 Issue 1 - December - 2023

Alkaline lands, their problems, analysis, and treatment methods

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ABSTRACT

Soil is the natural cradle for plant growth, and in it its roots extend and go deep, searching for water and food. Plant growth is necessarily affected by the characteristics of the bud and its ability to supply the plant with its various needs for nutrients in the appropriate quantities and at the right time (Kahlid, 1995).

Alkaline soils are defined as the land which the acidity number (ph) rises to high levels and values of up to 8 or 9 degrees. This type of soil is divided into sandy alkaline soils, calcareous alkaline soils, or clay soils. The quality of these soils varies according to the degree of their suitability to the plant. Alkaline sand, as soon as it is watered and washed with water, it becomes ready for planting, and the plant can absorb water and nourishment without any difficulties, land productivity increases as soon as water is available.

Calcareous alkaline soils are those lands in which the percentage of calcium carbonate and calcium bicarbonate is high. This type of soil is accompanied by many problems. These soils are usually red in color and the process of cultivation in them is often expensive

due to damage to agricultural tools and equipment. It can be concluded that the Alkaline soils, which are very common in semiarid and arid climates cover more than 25 % of the earth's surface. These soils are typically highly porous, freely draining and saturated with calcium carbonate. high cost fertilizers must be added to maintain a sustainable agriculture .

Keywords: alkaline lands, analysis

الأراضي القلوية تحليلها، مشاكلها وطرق معالجتها

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ملخَّص البحث:

التربة هى المهد الطبيعي لنمو النباتات وفيها تمتد جذوره وتتعمق باحثة عن الماء و الغذاء. ويتأثر نمو النبات بالضرورة بخواص المهد وقدرته على إمداد النبات باحتياجاته المختلفة من العناصر الغذائية بالكميات المناسبة وفى الوقت المناسب.(Kahlid, 1995)

تعرف الأراضي القلوية بأنها الأرض التى يرتفع فيها رقم الحموضة ph) (إلى نسب وقيم عالية تصل الى) 8 او 9 (درجات، وتنقسم هذا النوع من الترب إلى ترب قلوية رملية ،ترب قلوية كلسية أو طينية ،وتختلف نوعية هذه الترب بحسب درجة ملائمتها للنبات ،فالتربة القلوية الرملية بمجرد مايتم سقيها وغسلها بالماء تصبح جاهزة للزراعة. يستطيع النبات امتصاص الماء والغذاء بدون صعوبات تذكر فتزداد إنتاجية الأراضي بمجرد توفر المياه وينتشر هئا النوع من الترب في البئيات الجافة ةالشبه الجافة في العالم

الأراضى القلوية الكلسية تعرف بأنها تلك الأراضي التى يرتفع فيها نسبة كربونات وبيكربونات الكالسيوم وعادة ما يصاحب هذا النوع من الترب العديد من المشاكل . تكون هذه الترب حمراء اللون وغالبا ماتكون عملية الزراعة فيها مكلفة بسبب تلف الأدوات والمعدات الزراعية .

من السهل جدا التعرف على الترب القلوية الكلسية عن طريق التحليل المعملى.وايضا نستطيع معرفتها بمجرد الري بالماء اذ تتشكل طبقة صلبة رطبة لايستطيع النبات امتصاص الماء وكل مايحتاجه من المغذيات بسهولة، بسبب ارتفاع المنسوب الماء الأرضي وعدم قدرة الأرض على الصرف الجيد.

الكلمات المفتاحية: الأراضي القلوية، التحليل .

INTRODUCTION

Soils in arid semi-arid land are: inceptisols and entisols (49.1 %), aridisols (11.5 %), salorthids (10.7 %) and sandy soils (Atiah, 2005). Sandy alkaline soils bear more developed vegetation, with more regular and higher primary productivity than finer textured soils. Thus, profitably and commercially cultivated rain-fed olive orchards are grown on deep sandy alkaline soils under as little precipitation as 200 mm/year in the land area, although this is not possible without additional runoff to complement silt soils

This type of soil is prevalent in the arid semi-arid area, characterized by sandy textures, where the percentage of sand is more than 85%. Sandy soils formed as a result of sediment wind, they typically have very low water-holding capacities, are extremely low in all essential nutrients, most especially phosphorus, and are highly acidic in all except very arid climates (Alhkidy, 1989). This type of soil develops under semi-arid climate conditions, with an average annual amount of precipitation from 200-400 mm and mean annual air temperature of 18-21°C. Several methods are used in the field to indicate (ph), including: using reagents. Litmus paper (ph paper), or using a field device (ph meter) (Krummenacher. R. 1982).

Research problem

Alkaline soils in irrigated areas is becoming a serious problem for agriculture, especially in arid and semi-arid climates ، alkaline soil conditions have resulted in a reduction of the value and productivity of considerable areas of land throughout the world and lack of studies geographical studies concerned with this type of soil . Most of the studies adopted in official agriculture government were based on the results of previous studies undertaken by foreign investment companies.

Research objective

The objectives of the present study were as follows :

1-To analysis alkaline soil and finding the acidity value(ph)to know how to deal with the region’s soil and overcome its problems.

2-To focus on laboratory analysis as the ideal solution to know the types of soil spread in the region.

Distribution of alkaline lands

Historically, there has been little knowledge about the nature, distribution and mode of development of dry soils, which differ from those in wet areas. Soil acidity is a global problem and is a common condition in arid and semi-arid regions, Henry (1989). It arises due to human effectiveness in adding irrigation water without paying attention to correct management methods to control it. Because of the accumulation of salts such as sodium, calcium, potassium, and magnesium, the structure and construction of this type of soil is usually poor, sterile, and unsuitable for agriculture unless amendments are added to it. Alkaline soils, which are very common in semiarid and arid climates cover more than 25 % of the earth's surface. These soils are typically highly porous, freely draining and saturated with calcium carbonate **(Edwards, N.K. 1993).**

Overcoming alkaline soils:

It can be said that the methods of overcoming alkaline lands are very similar to the methods of overcoming saline lands and are summarized as follows:

1- Adding acidic fertilizers, or what is known as acid fertilization. In this process, we can provide the soil with acidity for the purpose of reducing its salinity and alkalinity by using fertilizers rich in sulfuric, nitric, and phosphoric, so the plant can absorb and obtain nutrients.
2- The problem of calcareous and alkaline soils can be overcome through irrigation, which is quick, ideal, and daily.
3- Irrigation is carried out in large quantities from the beginning of the plant's life until it rises above the soil surface.
4- Growing fruit crops on the surface of the soil. Due to the hardness and moisture that characterize this soil, it is recommended to stay away from crops located below the surface of the ground, such as potatoes and beets.
5- Adding organic fertilizers before planting, such as compost and decomposed local fertilizers, such as animal waste.
6- Measuring soil pH (laboratory analysis).

Steps of the laboratory analysis:

Study samples were taken randomly in some farms located on the Libyan coastal strip, for the purpose of laboratory analysis In order to measure soil acidity. The Libyan climate is influenced by the Mediterranean Sea in the north and the Sahara (Sahara) in the south, which leads to a significant rise in temperatures, a lack of rain.

Libyan soil falls within the scope of soils of the dry areas of the world, which are characterized by a lack of or a scarcity of rainfall that in turn, leads to a lack or absence of vegetation.

1-Distilled water
2-Plastic spoons
3- Paper towels
4- electrode pH meter
5- A glass cup

Laboratory analysis steps took place as follows:

1-Soil samples were collected from a depth of 15-30 Cm in a random sample. Each sample was numbered by a serial number in order to avoid confusion at the analysis stage. Items such as a shovel, bags, plastic cups, and paper were used to number the samples during the process of withdrawing them.

2-soil sample has been taken weighing about 50 grams in a 100 ml glass jar.

3- 50 grams of dried soil was extracted to be added to 50 CM^3 of distilled water at a 1:1 ratio

4-The sample was shaken well, and left long enough to obtain deposits from the solution(30 minutes).

5-The electrode pH meter device was placed in the solution and the display was read when it had stabilized. The device electrodes and sample jar were washed with distilled water and dried.

6- The results were recorded in a note book.

7-Evaluation according to the following table:

soil	Alkalinity coefficient
Neutral soil Translate	7
Alkaline soil	7>
acidic soil	7<

Source: Agriculture Centre, 2018.

Pictures showing laboratory analysis of alkaline soils

Source: field study

8-Results of the laboratory test indicated that the value of(ph) classified as Alkaline soil land table 2.

Table 2. Results of the laboratory analysis

Sample no	site	Depth horizon-cm	Calcium carbonate %	coordinates latitudes	Coordinates longitudes
1	Gargaresh	50	21,9	32°,52´	13°,06´
2	Mlita	50	22	32°,44´	13°,04´
3	Sopratah	50	18.1	32°,48´	13°,05´

Source: field study

These soils mostly occur in the regions of Al-Aziziyah, Zliten and Khoms. According to studies by Rogan *et al*.(2003), the reddish brown lithosols develop under conditions of semi-arid climate with an average annual precipitation from 200-400 mm, and mean annual air

temperature from 18-21°C (National Information Authority of Libya, 2002). It occurs on slopes and watershed surfaces of the hilly types of plains. The parent material is predominately represented by eluvial-deluvial and eluvial deposits of limestone.

This type of soil is prevalent In arid and semi-arid areas , characterized by sandy textures, where the percentage of sand is more than 85%. Sandy soils formed as a result of sediment wind, they typically have very low water-holding capacities, are extremely low in all essential nutrients, most especially phosphorus, and are highly alkaline in all except very arid climates (Alhkidy, 1989). This type of soil develops under semi-arid climate conditions, with an average annual amount of precipitation from 200-400 mm and mean annual air temperature of 18-21°C.

The formation of brown arid soils takes place under conditions of arid and extra-arid types of bio-climate, which are characterized by the alternation of a short 3-4 months moistening period and a long 8-9 months drying period. Mean annual temperature of these soils is about 20°C. Annual precipitations are 50-150 mm (Kahlid, 1995). Brown arid soils developed on eluvial-deluvial and eluvial-proluvial carbonate. The genesis of the brown arid soils is determined by the predominance of desert soil formation (Karim, 2001). The morphological features of brown arid soils can be summarized into: brown, light brown colour; layered structure of the upper horizon; and low humus content. Tables 3. And4. show some morphological and natural characteristics for this soil.

Table 3. Morphological and natural characteristics of dry calcareous soil

Depth horizon-cm	Colour in the dry state	Sand %	Silt %	Mud %
0-27	dark	33.8	41.0	24.6
27-68	Reddish yellow	63.8	15.6	0.6
68-120	Reddish yellow	59.6	15.7	24.7

Table4. Chemical properties of dry calcareous soil

Depth horizon-cm	Electrical conductivity ml Siemens / cm at 25m	Calcium carbonate%	Exchange capacity for cations ml / 100 g soil	Organic matter %	Mutual ratio of sodium %
0-27	0.79	21.9	2.8	0.71	11.2
27-68	0.40	21.9	6.1	0.58	8.2
68-170	0.65	18.1	8.7	0.73	2.9

While colour varied according to the original soil material, they were mostly light-coloured; as a result they contained large amounts of salt. In addition they also had spots, especially in layers, which appeared in the groundwater level with colours such as brown-green where it was also indicated that the located soil varied according to the colour and depth of the sector, and also that most of the soil was dry, located mainly on semi-flat surfaces and often had poor, low vegetation cover of the types of plants adapted to the salt. In other words, vegetation was lacking in some areas, as seen in Photos 1, 2, 3.

Photo 1 The heterogeneity of soil colour

Photo 2 The drought in the region.

Photo 3The quality of vegetation Mlita (32° 44´,13°.04´)

Vegetation is characterized by diversity and a variation of density, as a result of the varying conditions of the climate and aspects affecting the surface and soil. Alkaline soils can be dangerous since most plants prefer a slightly sour (acidic) soil but will generally tolerate a range of soil pH values. If the pH is outside the preferred range of the plant (too high or too low), nutrient deficiency and/or toxicity problems will develop.

Summary

Alkali soil: Alkali soil) is the soil that has a high degree of alkalinity and has a pH of 8. 5 or higher, or that contains a high percentage of exchangeable Calcium carbonate **and** sodium at 15% or more of The ability to exchange, or both. It contains enough alkaloids (sodium) to negatively affect the growth of most crop plants. This means that the percentage of Calcium and sodium on the soil particles is greater than the known percentage. This causes the soil particles to separate from each other and leads to poor drainage and the ground becomes swampy. The sodium level also affects the plant's absorption of nutrients. One of the manifestations of alkaline soil is the abundant growth of sage plants and the accumulation of water and its accumulation on the surface as shown in picture No. 1.

In this research, the focus was on alkaline soils in terms of their definition, distribution, and the most important problems

associated with them, soil samples were collected randomly between (**32°,44´ 32°,52´)** to analyze them and determine the pH to make some recommendations to avoid alkalinity problems, For the purpose of increasing soil productivity.

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