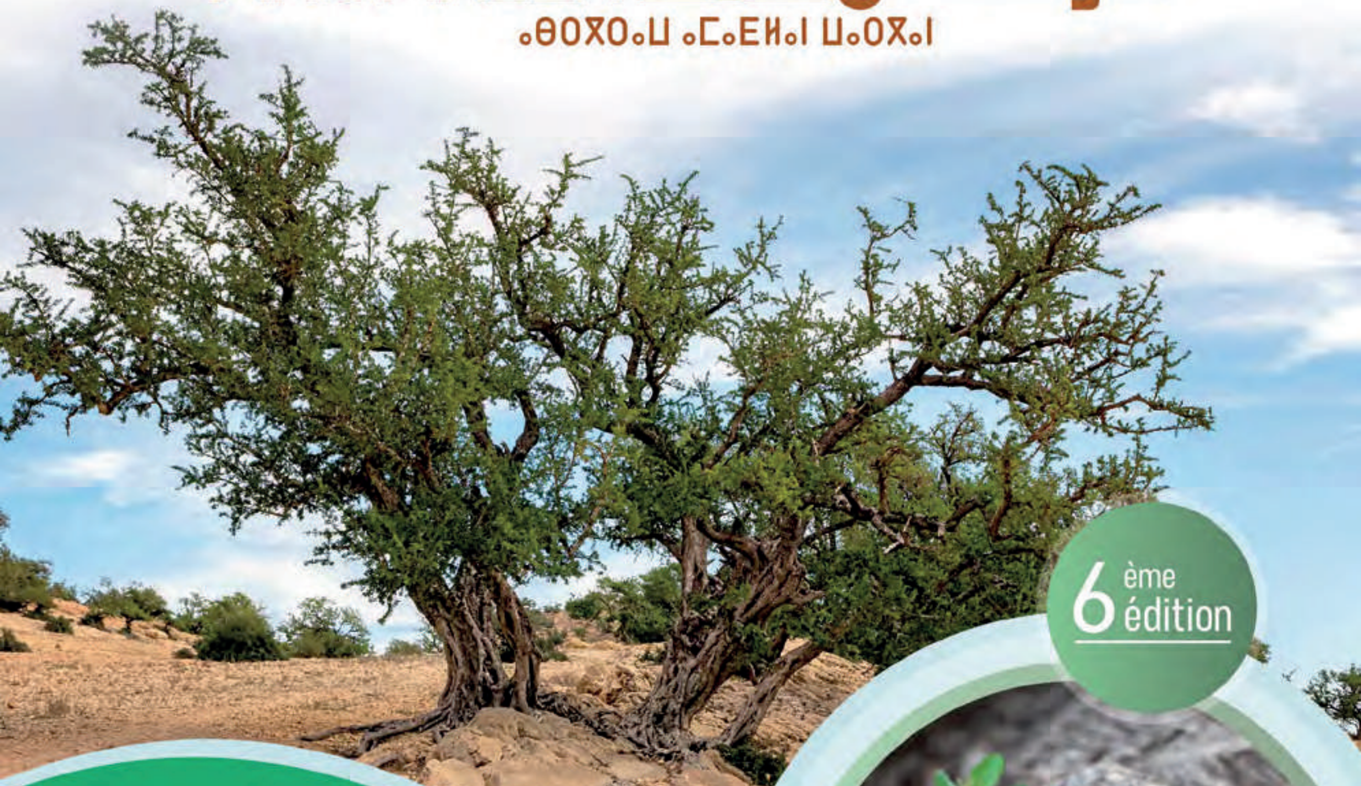
CONGRES INTERNATIONAL
ARGANIER

المؤتمر الدولي
لأركان



6 ème édition

L'Arganier, symbole de résilience

شجرة أركان، رمز المرونة و التأقلم

Argan tree, symbol of resilience

AGADIR,
DU 10 AU 13 MAI 2022
أكادير - من 10 إلى 13 ماي 2022

communications affichées

AXE 1

L'Arganier, symbole de résilience

شجرة الأركان، رمز الصمود

Argan tree, symbol of resilience

CONGRES INTERNATIONAL ARGANIER

المؤتمر الدولي للأركان

AGADIR, DU 10 AU 13 MAI 2022

أكادير - من 10 إلى 13 ماي 2022

6ème édition

L'arganier de Beni Snassene (Berkane) et de l'oued Grou (khemisset) : Diversité des champignons mycorhiziens et potentiel micorhizogène

ZADNI fatima zahra*, ElYacoubi houda, Ouallal imane, Rochdi atmane

Laboratoire : Ressources Naturelles et Développement Durable

Email :fatimazahra.zadni@gmail.com

Introduction

L'arganier (*Argania spinosa* (L.) Skeels) est une plante endémique du Maroc. Elle joue un rôle précieux dans l'équilibre biologique et occupe une surface d'environ 830.000 hectares au Centre-ouest (Radi,2003) soit 7% de la superficie forestière du Royaume. Au quaternaire, elle aurait été refoulée par l'invasion glaciaire. Ce qui expliquerait la subsistance de quelques peuplements au Nord-ouest du Maroc vers Rabat (Emberger,1925) et au Nord, près de la côte méditerranéenne dans les Beni-Snassen (Maire, 1925). L'arganeraie est reconnue comme réserve de la biosphère par l'UNESCO.

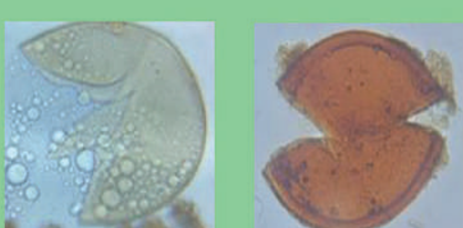
Matériels et méthodes

Une série d'échantillonnage sol/racines a été réalisée à raison de 5 répétitions par site aux niveaux des arganiers de berkane (benisnassen) et de khemisset (oued grou). Chaque échantillon est un mélange de 4 sous-échantillons pris autour d'un arbre à une profondeur allons jusqu'à 40 cm puis conservé de 0 à 3 mois à 4°C. La mycorhization naturelle de l'Arganier a été caractérisée sur les deux sites étudiés en analysant les systèmes racinaires par coloration décrite par Philips & Hayman (1970). Les spores mycorhiziennes sont isolées par la méthode de Gerdmann et Nicolson (1963), puis comptées et identifiées sous une loupe binoculaire et un microscope optique. Leurs caractéristiques morpho-anatomiques ont été identifiées en se basant sur les manuels d'identification (Brundrett et al., 1996) et le site de l'INVAM, puis déterminer le potentiel mycorhizogène du sol qui est considéré aussi comme un indicateur biologique de l'état de dégradation du sol selon la méthode de (Plenchette et *al,* 1989).

Résultats et discussion

Ces analyses nous a permis d'explorer l'organisation cytologique des mycorhizes observées chez l'arganier et qui sont de type arbusculaire. Les fréquences élevées de mycorhization confirment la dépendance de cette espèce vis-à- vis des champignons mycorhiziens (CMA). Par ailleurs, l'intensité de mycorhization (M) montre que l'efficacité de cette colonisation par les champignons endomycorhiziens n'est pas identique au niveau des sites étudiés : les échantillons de l'oued grou ont présenté une intensité plus élevée par rapport à Berkane. Cependant, l'isolement des spores de CMA a montré que les sols sont moyennement pourvus en spores et a révélé la présence de seize morphotypes de spores de champignons mycorhiziens à arbuscules sous les pieds des arganiers de Berkane et six à l'oued grou.

D'après les résultats du potentiel mycorhizien des sols étudiés on note que le site de berkane présente un PM plus élevé que celui de l'oued grou. Ces différences laissent suggérer que d'autres facteurs du sol des deux régions pourraient avoir une influence sur leur performance mycorhizienne.



Certains morphotypes de CMA trouvés sous les pieds des arganeraies prospectés

Fragment de racine d'arganier mycorhizée

Références

-Brundrett M, Bougher N, Dell B, Grove T et Maljezuk N (1996).

-Gerdmann et Nicolson, 1963. Trans. Br. Myco.soc., 46, 235-244.

-Philips J M et Hayman O S (1970).

L'Arganier, symbole de résilience
شجرة الأركان، رمز الصمود
Argan tree, symbol of resilience

CONGRES INTERNATIONAL ARGANIER
المؤتمر الدولي للأركان

AGADIR,
DU 10 AU 13 MAI 2022
أكادير - من 10 إلى 13 ماي 2022

6ème édition

EFFECTS OF CADMIUM AND CHROMIUM ON THE GROWTH OF ARGAN TREES (ARGANIA SPINOSA L).

Ainane A.[1*], Mohamed abdoul-latif F.[2], Ainane T.[1].

[1] *Superior School of Technology, University of Sultan MoulaySlimane, BP 170, Khenifra 54000 Morocco.*

[2] *Medicinal Research Institute, Center for Research and Study of Djibouti, BP 486, Djibouti.*

* *ainane.ayoub@gmail.com / +2126.72.34.97.24*

Abstract

Several works have focused on the argan tree of southwestern Morocco, either for physicochemical characterization, or to determine the by-products. Little work has been devoted to the study of the influence of heavy metals on the argan tree. Indeed, our work will focus, in the first place, on the effect of some heavy metals on the growth of argan tree in order to be able to find hidden information on the growth of this tree and to know the rheology against these threats.

In this study, we used a heavy metal solution (chromium or cadmium) separately in each experiment. One tree at each concentration and the experiment was performed in triplicate. The trees are watered every week. Each tree is watered with 20 ml of the same concentration of watering solution, and three trees are considered as controls and which were watered with tap water. The concentrations of the solutions used for watering are respectively: 1ppm, 1.5ppm, 2ppm and 2.5ppm in chromium and in cadmium.

The results show that the growth power of argan trees decreases with the increase in the concentration of heavy metals used (Cr, Cd). Trees that were sprayed with Cr and Cd solutions died after three months of watering.

Introduction

The argan tree (Argania spinosa L. Skeels) is a plant of the Sapotaceae family. It is a tree endemic to southwestern Morocco, particularly the Sous Plain. This particular species from North Africa, both for its botanical and bioecological interest as well as for its socio-economic value and its great diversity, is threatened with extinction. The argan tree is an oleo-agrosylvo-pastoral tree. The argan grove covers more than 820,000 ha and has more than 20 million argan trees in Morocco. It grows wild and in abundance in arid and semi-arid areas, where it plays an irreplaceable role in ecological balance and in the preservation of biodiversity. It is of great economic interest thanks to its multiple uses. Each part of the tree is usable and constitutes a source of income or food for the user: the wood is used as fuel, the leaves and fruits are fodder for goats estimated by tens of thousands of goats and camels, and the oil extracted from the almond is used for human consumption, in particular rural food and in traditional medicine. Among the products derived from argan, argan oil remains the flagship product which enjoys an increasingly growing interest in Morocco and internationally. Its nutritional qualities and cosmetic virtues have conquered thousands of consumers around the world and are creating a whole economic dynamic, social and institutional organization around the argan grove. The argan sector, in particular its argan oil value chain, generates millions of dirhams annually. However, apart from the fact that the quantified estimate of the economic value of the productions of the argan sector is little known, it suffers from many constraints. The advance of drought and overexploitation, accentuated by climate change, are losing large areas of the argan grove year after year. In addition, there are the problems of productive efficiency and inequity in the distribution of added value created in the argan value chain.

In this context, this study will first focus on the effect of some heavy metals on the growth of argan tree in order to be able to find hidden information on the growth of this tree and to know the rheology against these threats.

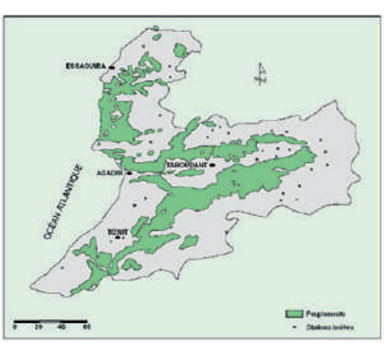


Figure 1: Distribution area of the Moroccan argan tree.

Material and Methods

Places of work and origin of seedlings:

This experiment is carried out at the level of the laboratory of the Higher School of Technology, University of Sultan Moulay Slimane, Khenifra-Morocco. The plant material used for its tests comes from the regions of Agadir (in 2019).

The experimental protocol:

The plant material used for these tests comes from argan trees. The watering solutions consist of four batches of chromium and cadmium concentrations, similar to that of the wastewater found near the Argan trees in the Agadir region.

In this study, we used a heavy metal solution (chromium or cadmium) separately in each experiment. In buckets, the trees are placed in a culture chamber at a temperature of 25 ± 2 ° C, under a light intensity of 2500 lux and a daily photoperiod of 16 hours for two months. Afterwards, they were placed elsewhere in the open air. Four increasing concentrations, (1ppm, 1.5ppm, 2ppm and 2.5ppm) of chromium or cadmium were tested, each tree is watered every week with 20 ml including the concentration of watering solution in order to determine the threshold that hinders the growth. For the entire trial, 27 trees were seeded, 1 tree per triplicate concentration for each heavy metal, and watering solutions were prepared each month under the same conditions. As well as three witnesses who were sprayed with tap water. After 6 months of watering, the lengths of the stem were measured. The results are represented by the average of the values obtained.

Results and Discussion

Effect of chromium and cadmium:

According to the results obtained, the existence of chromium at a concentration of 1ppm to 2.5ppm hardly improves the growth of the stems. It is noted that the appearance of leaves on twigs and stems is only observed on 25% of trees. The results of the size of the argan trees and the averages of the growth rates obtained vary from 13.66% for the control and respectively 12.88%, 9.71%, 8.19%, and 6.97% for the control. The concentrations used as shown in Table 1. On the other hand the concentrations of chromium used in this experiment, we observed the death of all the trees after two months of watering, this means that the chromium to inhibit the growth of argan trees.

According to the results obtained, the existence of cadmium at a concentration of 1ppm to 2.5ppm and also hardly improves the growth of the stems. It is noted that the appearance of leaves on twigs and stems is only observed on 18% of trees. The results of the size of the argan trees and the averages of the growth rates obtained vary from 13.17% for the control and respectively 13.17%, 12.21%, 6.83%, 2.34% and 1 , 16% for the concentrations used as shown in Table 2. On the other hand the concentrations of cadmium used in this experiment, we observed the death of all the trees after two months of watering this means that the cadmium to inhibit the growth of argan trees.

In general, the two heavy metals used in this experiment (chromium and cadmium) showed a remarkable slowdown in growth during the first two months of watering.

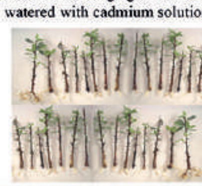
The crossing rate of the witnesses is the most roaring while the rate in the presence of chromes is higher than that of cadmium. After 2 months of watering in the presence of the two heavy metals, it is observed that the seedlings of the argan tree are dead, which shows the toxicological effect of the heavy metals used in these experiments.

Chromium concentration	Size (cm) before watering	Size (cm) after 2 month	Size (cm) after 4 month	growth rate (%)after 2 month
0ppm	16,1	18,3	20,4	13,66
1ppm	16,3	18,4	-	12,88
1,5ppm	17,5	19,2	-	9,71
2ppm	17,1	18,5	-	8,19

Table 1: Tree size as a function of watering concentrations and average growth rates of argan trees watered with chromium solutions.

Cadmium concentration	Size (cm) before watering	Size (cm) after 2 month	Size (cm) after 4 month	growth rate (%)after 2 month
0ppm	16,7	18,9	20,9	13,17
1ppm	17,2	19,3	-	12,21
1,5ppm	16,1	17,2	-	6,83
2ppm	17,1	17,5	-	2,34

Table 2: Size of trees as a function of watering concentrations and the average growth rates of argan trees watered with cadmium solutions



Conclusion

The contribution of chromium and cadmium on the growth of argan trees has a remarkable effect on the growth of the argan trees studied. The addition of heavy metals (chromium and cadmium) limits the growth of argan trees. The results obtained give us other aspects of scientific research, more precisely in the mechanisms of interactions plant heavy metals and the kinetics of the interactions of the phenomenon of transfer of matter.

STUDY OF THE EFFECT OF PRETREATMENTS ON THE GERMINATION OF SEEDS OF ARGANIA SPINOSA L.

Tarik AINANE[1], Fatouma MOHAMED ABDOUL-LATIF[2], Ayoub AINANE[1]

[1]Superior School of Technology,University of Sultan MoulaySlimane, BP 170, Khenifra 54000 Morocco.
[2]Medicinal Research Institute, Center for Research and Study of Djibouti, BP 486, Djibouti.

Abstract

The argan tree (Argania spinosa L. Skeels), which belongs to the sapotaceae family, is the second largest forest species in Morocco. It occupies an area of around 871,000 hectares (IFN, 1996). This species endemic to Morocco and irreplaceable in its range is of interest both ecologically and socio-economically. The argan tree is the last green bulwark in the fight against desertification in southwest Morocco. Indeed, thanks to its resistance to aridity and its hardiness, the argan tree, with its floral procession, ensures the protection of the soil against wind and water erosion, thus favoring the water recharge of the water tables and the protection of infrastructure. Under specific conditions argan seeds are affected by mechanical dormancy which hinders or delays their germination under natural conditions. This is why forest managers have resorted for several years to artificial regeneration by planting. Therefore, certain pretreatments are carried out on the seeds in order to promote germination. This work was undertaken to compare the different pretreatments used on argan seeds for germination from different provenances (Tiznit, Taroudant, Berkane, Agadir, Essaouira).The pretreatments used are: immersion of the seeds in tap water for 48 h, immersion of the seeds in boiling water for 5 min, immersion of the seeds in concentrated sulfuric acid for 2 h, l 'immersion of the seeds in hydrogen peroxide for 7 days and finally manual scarification using an abrasive paper with as a control the immersion of the seeds in distilled water. These pretreatments were tested in comparison with the untreated distilled water control. After carrying out the pretreatment operations, we placed the seeds in petri dishes containing Whatman paper previously sterilized and soaked in sterile distilled water. The test is carried out at room temperature. In addition, for each source of each pretreatment we carried out three repetitions at the rate of ten seeds per petri dish. The results showed that immersing the seeds in hydrogen peroxide for seven days gives the highest germination rate as well as the latency time with a shorter average duration.

Experimental conditions

1: Origin and preparation of the seeds:
This experiment is carried out at the level of the laboratory at the Higher School of Technology, University of Sultan Moulay Slimane, Khenifra-Morocco. The plant material consists of ripe argan seeds harvested during the ripening period (between June and July 2019) in five provenances (Tiznit, Taroudant, Berkane, Agadir, Essaouira). The seeds were dried then shelled and disinfected with diluted bleach for 5 minutes. Then they are rinsed with tap water.

2: Seed pretreatment and installation of the protocol:This experiment consists in making a comparison between five pretreatments (tap water, boiling water, manual scarification, hydrogen peroxide and sulfuric acid) with distilled water as a control.

- ✓ **Tap water: This treatment involves soaking the seeds in tap water for 48 hours. This method is the most used for the argan tree in nurseries.**
- ✓ **Boiling water: For this type of pre-treatment, we soaked the seeds from each source in boiling water (100 ° C) for five minutes and then in tap water for 48 hours.**
- ✓ **Manual scarification: This method is done using sandpaper. The method consists of making a small cut in the seed coat on the opposite side of the embryo and then soaking the seeds in tap water for 24 hours.**
- ✓ **Hydrogen peroxide: Immersion of seeds from each source in hydrogen peroxide (10 Volume) for seven days.**
- ✓ **Sulfuric Acid: The seeds from each provenance were soaked in concentrated sulfuric acid (H2SO4) for two hours, then rinsed with distilled water and then soaked in tap water for 24 hours. Indeed, these pretreatments were tested in comparison with the control (distilled water) untreated.**

After these pretreatments we placed the seeds in petri dishes containing Whatman paper previously sterilized and soaked in sterile distilled water. The test is carried out at room temperature. In addition, for each source of each pretreatment we carried out four repetitions at the rate of twenty seeds per petri dish.
Parameters tracked:
The parameters tracked are as follows:
Standby time: This is the time that elapses from the start of placing the seeds in the petri dishes until the first germination.
Germination rate (Tg %): Number of seeds having germinated during a given time compared to the number of total seeds germinated. This rate is calculated based on the following equation:Tg (%) = (n × 100) / N
Tg (%) = germination rate. n = Number of germinated seeds.N = Total number of seeds germinated.

Results

Average germination time (days)						
pretreatments	witness	Tap water	Boiling water	sulfuric acid H_2SO_4	hydrogen peroxide H2O2	manual scarification
Tiznit	25	24	20	18	14	24
Taroudant	25	25	21	19	15	25
Berkane	25	24	20	19	14	24
Agadir	25	24	20	17	13	23
Essaouira	25	25	21	18	14	24

germination rate (%)						
	witness	Tap water	Boiling water	sulfuric acid H_2SO_4	hydrogen peroxide H2O2	manual scarification
Tiznit	40	43.33	50	73.33	83.33	53.33
Taroudant	43.33	50	56.66	63.33	80	53.33
Berkane	33.33	36.66	40	63.33	76.66	40
Agadir	16.66	20	36.66	60	73.33	23.33
Essaouira	23.33	30	36.66	60	70	33.33

The germination rate at the end of the test for the different treatments shows that soaking the argan seeds in hydrogen peroxide for seven days achieves the highest germination rate.
for all preprocessing and according to our observations, the latency time varies depending on the preprocessing.

Conclusion

The seeds of the argan tree have very hard seed coats causing problems with inhibition of germination. for this Some studied pretreatments can be used to effectively eliminate integumentary inhibition; such as tap water, boiling water, manual scarification, sulfuric acid, hydrogen peroxide. The comparison of these different pretreatments on argan seeds from various origins shows the effect of the pretreatment which has a very important role on seed germination.The results show that chemical pretreatments give better results compared to physical pretreatments. In addition it depends on the effect of provenances on seed germination.

L'Arganier, symbole de résilience
شجرة الأركان، رمز الصمود
Argan tree, symbol of resilience

CONGRES INTERNATIONAL ARGANIER
المؤتمر الدولي للأركان
AGADIR, DU 10 AU 13 MAI 2022
أكادير - من 10 إلى 13 ماي 2022
6ème édition

Approches génomiques pour la caractérisation de la qualité de l'huile d'argan

ELFAQER Abdelmoiz[1], RABEH Karim[1], ALAMI Mohammed[1], FILALI-MALTOUF Abdelkarim[1], BELKADI Bouchra[1]

Laboratoire de Microbiologie et biologie Moléculaire, Centre de Biotechnologie végétale et microbienne, biodiversité et Environnement, Faculté des Sciences, Université Mohammed V, Rabat, B.P. 1014 RP, Maroc.

Introduction

L'huile d'argan suscite beaucoup d'intérêt vue ses diverses utilisations curatives, nutritionnelles et cosmétiques. Ces différentes propriétés sont liées à sa composition chimique intéressante, riche en antioxydants, ainsi que par la présence de polyphénols, stérols et acides gras spécifiques.

Plusieurs variables biochimiques peuvent déterminer la qualité d'une huile végétale : l'acidité, l'indice de peroxyde, l'absorption E232, l'absorption E270, les tocophérols et les acides gras (Acides gras saturés, Acides gras mono-insaturés et les acides gras polyinsaturés). Toutefois, ces variables dépendent des conditions de l'environnement donnant des résultats parfois approximatifs et insuffisants pour permettre la traçabilité de l'huile et attester de la qualité de l'échantillon analysé et de son origine. L'utilisation de biomarqueurs génomiques permettent de compléter l'apport des caractéristiques biochimiques pour une meilleure caractérisation, une authentification et une traçabilité des huiles.

Objectifs de l'étude

- Recherche *In Silico* de biomarqueurs génomiques liés à la qualité d'huile d'argan par prédiction des gènes de la famille Fatty Acid Desaturase (FADs).
- Evaluation de la relation potentielle entre les paramètres de qualité de l'huile d'argan de différents origines et les biomarqueurs génomiques identifiés.

Étude bioinformatique et génomique

Approche gène candidat

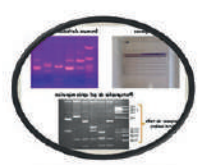
Recherche et identification des séquences de la famille désaturase → Alignement de séquences de gènes à partir du Draft du génome de l'arganier → Prédiction des gènes → Motifs communs et conservés

Conception de 18 amorces

Relation évolutive de la famille des gènes désaturases chez différentes espèces oléagineuses

Analyse par la méthode « Neighbour Joining »

Approche génomique



Extraction d'acides nucléiques à partir de matériel d'arganier

ADNs extraits des feuilles et de l'huile

ARN des graines

Validation des biomarqueurs génomiques

Etude d'expression des gènes FADs

CONCLUSION

L'identification de ces biomarqueurs génomiques seront utiles pour l'authentification, la traçabilité de l'huile d'argan et sa protection par la certification et l'obtention d'un label de qualité.

Contribution to the mycological study of the Argan fruit of the Argan *Argania Spinosa* tree

Ait Lamallam W.[1], Ejjaki S.[1], Lamrani K.[1] & Janati Idrissi F.E.[2], Ouchbani T.*[2]
[1]Laboratory of Microbiology, AgroFood Section. Hassan II Institute of Agronomy and Veterinary Medicine Rabat, Morocco
[2]Laboratory of Extraction Processing and Natural Products Analysis. AgroFood Section. Hassan II Institute of Agronomy and Veterinary Medicine Rabat, Morocco.
*t.ouchbani@iav.ac.ma

Abstract

The Argan fruit is rich in nutrients and is a source of carbon and nitrogen necessary for the growth of toxigenic molds which can develop toxic metabolites under environmental and storage conditions **[1]**. Indeed, Fungi can cause adverse human health effects to many organ systems. Diseases caused by fungi are spread by direct implantation or inhalation of spores. In addition to infection and allergy, fungi can produce mycotoxins and organic chemicals that are responsible for various toxicologic effects **[2]**. The present work has focused on microbiological study and quality of samples presenting the different parts of Argan fruit: the pulp, the shell, the seed, and the Press cake. 308 predominantly mesophilic strains were isolated. These strains belong to the genera: *Aspergillus, Mucor, Humicola. Alternaria, Cladosporium, Fusarium, Monascus, Paecilomyces* and *Penicillium*.

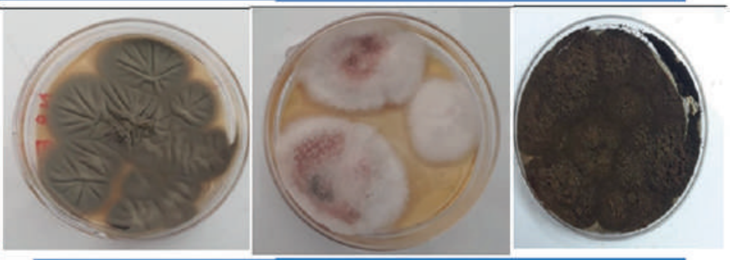
Keywords: Argan tree, molds, Argan fruit, mycoflora, *Aspergillus,* toxigenic, mesophilic strains.

Introduction

The Argan tree is a multipurpose tree of great socio-economic interest for southwestern Morocco **[3]**. The main interest of this tree lies in its fruit from which an oil of high nutritional, cosmetic and medicinal value is extracted and in its leaves which are used as animal feed **[4]**. The present work has focused on microbiological study and quality of samples presenting the different parts of Argan fruit: the pulp, the shell, the seed, and the Press cake. The isolation of all the mycoflora found on the samples made it possible first to study the diversity of this mycoflora and then to select the strains known to be toxigenic.

Material and methods

The samples that were analyzed during this study were from Essaouira. samples presenting the different parts of Argan fruit: the pulp, the shell, the seed, and the Press cake, were used for the isolation of natural mycoflora and four crushed samples were used only for the search of mycotoxins. Five culture media were used: Malt Extract Agar (MEA) medium, Czapek Dox Agar medium, Potato Dextrose Agar (PDA) medium, Chloramphenicol Sabouraud Agar medium, and Chloramphenicol Glucose Agar medium. plates for the isolation of mesophilic strains were incubated at 25°C for 5 days and those for the isolation of thermophilic strains at 50°C for 48 hours



Results and discussion

308 predominantly mesophilic strains were isolated. These strains belong to the genera: *Aspergillus, Mucor, Humicola. Alternaria, Cladosporium, Fusarium, Monascus, Paecilomyces* and *Penicillium*. The genus *Aspergillus* is the most frequent in all samples. It is present in the pulp samples at a percentage of 46.15%, in the shell sample at 72%, in the samples of amends and molded amend at 54.05% and 83.33% respectively and in the samples of Press cake and molded Press cake at 70.49% and 23.08% respectively. The dominance of *Aspergillus* was represented by the species: *Aspergillus fumigatus, Aspergillus niger, Aspergillus flavus* and *Aspergillus awamori*.

Conclusion

We have shown through this study that the fruits of the Argan tree are, on the one hand, contaminated by both field molds (Fusarium) and storage molds (Aspergillus, Penicillium ...). On the other hand, the slightly high humidity level showed quite worrying levels of contamination of aflatoxins B1, B2, G1 and G2, ochratoxin A and zearalenone.
In view of these results and in order to significantly improve the quality of the fruits of the Argan tree and argan oil, it is strongly recommended to respect the rules of hygiene, improve the conditions of storage, reduce its duration and modernize the processing units.

Acknowledgments: The present study is supported by SATREPS project, Japanese International Cooperation Agency (JICA).

References

[3] Adlouni, A. (2010). L'huile d'argan, de la nutrition à la santé. *Phytothérapie.* (8) : 89–97.
[1] Naggar, M. (2018). La gestion durable de l'arganeraie et les enjeux de lutte contre la désertification. *Espace Géographique et Société Marocaine.*22(1) :81-91.
[2] Fung F., Clark RF. (2004). Health effects of mycotoxins: a toxicological overview. Journal of Toxicology and Clinical Toxicology. 42 (2):217-34.
[4] Moukal, A. (2004). L'arganier, Argania spinose L. (skeels), usage thérapeutique, cosmétique et alimentaire. *Phytothérapie.* 2(5) :135-141.

AMCDD
Alliance Marocaine pour le Climat et le Développement Durable
الائتلاف المغربي من أجل المناخ والتنمية المستدامة

BIOCHAR : Troisième Révolution Verte et Un Outil Puissant et Simple pour Combattre le Changement Climatique et Réussir la plantation de l'Argano-culture dans les zones arides et semi-arides

Mohamed BOULMANE (1), Driss ACHBAL (2) et Abderahim KSIRI (3)

(1)Chef Division ATCEP au sein du CR-BMK, Membre du Bureau National de l'AMCDD et Vice Président de l'AESVT- BM.

(2)DGS au sein du CR-BMK et Président de l'Association Géoparc M'Goun

(3)Coordonnateur de l'AMCDD et Président de l'AESVT

Introduction

Le biochar est un Produit carboné microporeux résultant de la thermo-dégradation de la biomasse (matières organiques) en l'absence d'oxygène (pyrolyse). Il est distingué du charbon de bois (obtenu par carbonisation) à usage énergétique par son orientation à être utilisé comme amendement du sol.

On peut le fabriquer à de résidus forestiers, agricoles, ménagers, boues des STEP,…. C'est un produit artificiel d'origine végétale qu'on peut fabriquer de façon industrielle ou traditionnelle. Il est utilisé pour l'amendement des sols surtout dégradés ou se trouvant dans les zones arides et semi-arides.

Le biochar est un intrant qui augmente les rendements agricoles 3 à 4 fois supérieurs aux autres sols locaux ; d'une manière écologique en séquestrant du carbone. Selon les recherches de Glaser, un hectare de terra preta contient 250 tonnes de carbone. Ainsi des études scientifiques ont estimé qu'une création et une utilisation judicieuses de terres noires permettraient de stocker jusqu'à 9,5 milliards de tonnes par an. ***En 2018 et 2019, le GIEC a publié deux rapports examinant le potentiel du biochar pour l'élimination permanente du carbone. Il a estimé le potentiel de compensation annuel du biochar à 1 à 2 milliards de tonnes de CO_2 s'il devait être déployé à une échelle mondiale massive. Alors que les gouvernements et les entreprises du monde entier visent à être neutre en carbone, cette reconnaissance scientifique définitive se tourne vers le biochar comme un moyen essentiel d'atténuer notre crise climatique.***

Effets de l'amendement des sols par le biochar

Les effets de l'utilisation du biochar comme amendement des sols sont très nombreuses et leurs impacts sont très diversifiés, on cite par exemple :

- Augmentation de la croissance des plantes. Cependant il semble que dans de nombreux cas, il soit nécessaire de le coupler avec une fumure minérale
- Restructuration du sol, améliorant ses propriétés physiques.
- Amélioration Augmentation de la capacité de rétention d'eau dans les sols (jusqu'à +18%).
- Accroissement du pH des sols acides (1 point de plus en moyenne)
- Aide au développement de la microflore des sols et accroissement de leur activité biologique (+40% de champignons de mycorhize).
- Diminution du lessivage des nutriments, notamment des nitrates pour la pollution des nappes phréatiques.
- Diminution des émissions de NO_2 et de méthane dans les sols hydromorphes ;
- Diminution de la toxicité aluminique dans certains sols.
- Amélioration de la rétention des nutriments (+50% d'échanges cationiques)
- Augmentation de la matière organique du sol
- Le rendement (poids de biochar produit par rapport au poids de la biomasse à 15 % d'humidité) atteint 35 % à 45 %, selon le type de biomasse.

Biochar pour remplacer le charbon de bois

C'est fondamentalement, un « charbon de bois éthique », la valeur du biochar ne se limite pas à l'agriculture. Contrairement à la plupart du charbon de bois, qui provoque une déforestation à grande échelle, le biochar est délibérément fabriqué à partir de déchets agricoles / forestiers et autres en utilisant la technologie de la pyrolyse.

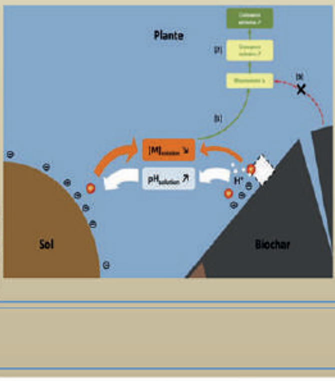
Ce charbon vert (Biochar) évite non seulement les émissions liées à la combustion d'une biomasse non renouvelable, mais également les grandes quantités de méthane (CH_4) générées par la production artisanale de charbon de bois. Le CH_4 est un gaz à effet de serre dont le potentiel de réchauffement climatique est environ 25 fois supérieur au CO_2 (sur une période de 100 ans), ce qui le rend particulièrement nocif.

L'utilisation du charbon de bois dans les pays en développement, et en particulier en Afrique, est une source majeure de déforestation et de perte de biodiversité. En considérant les effets de déforestation évitée et d'évitement du méthane, l'estimation (sur la base d'une méthodologie de la CCNUCC) qu'une tonne de charbon vert équivaut à 4 tonnes de CO_2 évitées.

Le charbon vert n'émet pas d'hydrocarbures dans les fumées et environ quatre millions de femmes et d'enfants qui meurent chaque année en respirant des fumées de charbon de bois pourraient être sauvés

Conclusion

Le Biochar est une solution très efficace et efficience pour conserver et lutter contre la dégradation de nos ressources naturelles (eau et fertilité des sols,…) dont nos exploitation dépasse leurs renouvellement.



boulmanem@yahoo.fr