CURRICULUM VITAE

Surname : **GHOULAM** First name : **Cherki**
Position : **Professor Researcher** Full Professor (**PES « C »)**
Specialty : **Agro-Biotechnology / Agro-ecology**
Laboratory : **Agrobiotechnology & Bioengineering**
Adress : **Department of Biology, Faculty of Sciences and Techniques**
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Research topics, Expertise, and supervision :

Research Topics:

- Research on the effects of biotic and abiotic stresses on plant species of agro-economic interests and selection of more performing varieties.
- Agrophysiological and molecular characterisation of tolerance of legume-rhizobia symbiosis to abiotic stresses (Salinity, water deficit, phosphorus deficiency)
- Biological Nitrogen fixation and Interactions Plants-microorganisms
- Agro-ecology and Organic farming (Biological agriculture)
- Biofertilizers and biostimulants
- Biosaline Agriculture : Integrated farming practices in saline lands
- Agrosystems and their management

Expertise :

-Expert évaluateur auprès du CNRST et MESRI pour projets nationaux et internationaux :
* Evaluation de pré-projets
*Evaluation de projets de recherche appliquée
* Evaluation de rapports mi-parcours

-Expert évaluateur auprès de l'Université Mohammed VI Polytechnique de Benguerir (UM6P) :
* Evaluation de pré-projets et de projets de Transfert de Technologie
*Evaluation de pré-projets et projet de Recherche Développement

-Expert auprès de la Fondation PhosBoucraa (OCP) :
*Evaluation de projets en Agriculture Biosaline
*Evaluation de rapports mi-parcours des projets

Coordinated Research Projects:

- Morocco –Spain cooperation projects N° A/3595/05 et N° A/5033/06R (2006-2008) (Spanish partner: University of Granada)
- Moroccan –Spain cooperation project N° 578/08 (2009-2010) (Spanish partner: University of Granada)
- Morocco-Tunisia cooperation project N° 26 MT08 (2009-2010) (Tunisian partner: INRA of Tunis)
- Morocco- France cooperation project PRAD N° 06-08 (2006-2008) (French partner: INRA-Montpellier)
- Morocco- France cooperation project PRAD N° 12-09 (2012-2014) (French partner: Sup-Agro, Montpellier)
- Morocco- France cooperation project PRAD N° 13-08 (2013-2015) (French partner: INRA-Nice)
- Moroccan Coordinator of FABATRPIMED multinational Consortium (2011-2015) (Partners: INRA, IRD, CIRAD-Montpellier; INRA Tunis, University of Oran, University of Bamako)
- Morocco-Sweden-Canada cooperation project (2011-2012)(Partners: University of Agriculture-Alnarp-Sweden, University of Toronto, Canada)
- Moroccan Coordinator of ENVIMED (Morocco-France-Algeria-Italia) project (2013-2014)(Partners : INRA-Nice ; University of Oran and Univ. of Torino)
- Morocco- Germany cooperation project PMARS II N° 12-04 (2013-2015) (German partner: Univ. of Aachen)
- Project PHC-Maghreb 18MAG13 (2018 – 2021) Maghreb – France cooperation (partners: Sup-Agro, Montpellier, INRA-Nice, Univ. of Constantine, Biotechnology, Center Borj Cedria, Tunisie)
- Project VLIR-UOS (SI) N° MA2018S1N2254103 (2018 – 2020) Morocco- Belgium cooperation (Belgian partner: Univ. of Ghent)
- Project CNRST-NRDIO (2019 – 2021) Morocco-Hungary cooperation (Hungarian partner: Academic Center for Biological Research, Szeged)
- Project ERA-Net FOSC (2021 – 2024) International Consortium (Partners : Univ. Of Amsterdam, and The SALT Doctors BV; Salt Farm Foundation (Netherland); Flanders Research Institute for Agriculture, Fisheries and Food, Melle and KU. Leuven (Belgium), Univ. of Florence (Italy), Faculty of Agriculture, Kafr El Sheikh, (Egypt); Univ. of Oldenburg.
- Morocco-Hungary cooperation project (2023 – 2026) (Hungarian partner: Academic Center for Biological Research, Szeged and Biofil Agricultural Company)

Supervision :

Master Memories supervised :

More than 30 Master thesis supervised

PhD Thesis Supervised :

- Mandri Btissam, 2012. Adaptation of Common bean (Phaseolus vulgaris)-rhizobia symbiosis to phosphorus deficiency: agrophysiological characterization of tolerance and impact on P bioavailability in the rhizosphere. PhD Thesis, Cadi Ayyad University of Marrakech.
- Bargaz Adnane, 2012. Selection and characterization of more performing common bean (*Phaseolus vulgaris*)-rhizobia symbiosis for biological nitrogen fixation under phosphorus deficiency. PhD Thesis, Cadi Ayyad University of Marrakech

-Faghire Mustapha, 2012. The role of symbiotic microorganisms (case of rhizobia) in improvement of Common bean (*Phaseolus vulgaris*) production under osmotic stress. PhD Thesis, Cadi Ayyad University of Marrakech

- Farissi Mohamed, 2013. Agrophysiological and molecular characterization of tolerance to salinity stress in Moroccan Alfalfa (*Medicago sativa*) populations. PhD Thesis, Cadi Ayyad University of Marrakech

-Mouradi Mohammed, 2017. Agrophysiological and molecular characterization of tolerance of Alfalfa (*Medicago sativa*)-rhizobia symbiosis to water deficit. PhD Thesis, Cadi Ayyad University of Marrakech.

-Makoudi Bouchra, 2018. Selection and agrophysiological and molecular characterization of Faba bean (*Vicia faba*) –rhizobia symbiosis with high phosphorus use efficiency for biological nitrogen fixation under phosphorus deficiency. PhD Thesis, Cadi Ayyad University of Marrakech.

-Kabbaj Ablaa, 2019. Adaptation of Faba bean (*Vicia faba*)-rhizobia symbiosis to water deficit : Agrophysiological aspects and involvment of redox system. PhD Thesis, Cadi Ayyad University of Marrakech

-Oukaltouma Khawla, 2021. Selection and characterization of legume-rhizobacteria symbiosis with high phosphorus use efficiency for biological nitrogen fixation under water deficit. PhD Thesis, Cadi Ayyad University of Marrakech.

-Lahrizi Yahya, 2022. Assessment and characterization of tolerance to water deficit in Alfalfa (*Medicago sativa* L.)-rhizobia symbiosis and its impact on wheat in rotation. PhD Thesis, Cadi Ayyad University of Marrakech.

-Elhaissoufi Wissal, 2023. Optimization of phosphate use efficience through the exploitation of interaction between plant roots and rhizobacteria with high solubilisation potential. PhD Thesis, Cadi Ayyad University of Marrakech.

-Khadraji Ahmed, 2023. Agrophysiological characterization of tolerance of chick pea (*Cicer arietinum*) to some abiotic stresses. PhD Thesis, Cadi Ayyad University of Marrakech.

-Cheto Said (2020-2024). Selection of rhizobacterial consortia efficient for biofertilization of legumes/cereals under stressing conditions in Moroccan agrosystems. PhD Thesis, Cadi Ayyad University of Marrakech. *(Thesis in progress).*

-Bourhim Mohammed Redouane (2021-2024). Agromorphological, physiological and technological characterization of tolerance to salinity in Quinoa **(***Chenopodium quinoa*): Analysis of the effects of some soil amendments. PhD Thesis, Cadi Ayyad University of Marrakech. *(Thesis in progress).*

-Barghout Houda (2023-2027). Developement of rhizobacteria inoculum to improve faba bean production and its agroecological services under climate change. PhD Thesis, Cadi Ayyad University of Marrakech. *(Thesis in progress).*

-Chamchaoui Abdellatif (2023-2027). Amélioration de la résilience de la culture de l'olivier aux contraintes pédoclimatiques marginales : optimisation de l'interaction fertilisation-régime d'irrigation. PhD Thesis, Cadi Ayyad University of Marrakech. *(Thesis in progress)*

Scientific Production :

Publications:

Articles published in international journals indexed Web Of Science (WOS) :

-Chamkhi I, Zwanzig J, Ibnyasser A, Cheto S, Geistlinger J, Saidi R, Zeroual Y, Kouisni L, Bargaz A and **Ghoulam C**., **2023**. *Siccibacter colletis* as a member of the plant growth-promoting rhizobacteria consortium to improve faba-bean growth and alleviate phosphorus deficiency stress. *Front. Sustain. Food Syst. 7:1134809. doi: 10.3389/fsufs.2023.1134809*

-Cheto S, Oukaltouma K, Chamkhi I, IbnYasser A, Benmrid B, Qaddoury A, Kouisni L, Geistlinger J, Zeroual Y, Bargaz A and **Ghoulam C.**, **2023**. Inoculation with rhizobacterial consortia alleviates combined water and phosphorus deficit stress in intercropped faba bean and wheat. *Front. Sustain. Food Syst. 7:1147939. doi: 10.3389/fsufs.2023.1147939*

-Wissal Elhaissoufi, Ammar Ibnyasser, Meryem Haddine, Youssef Zeroual, Rachid Ghani, Abdellatif Barakat, Zineb Rchiad, **Cherki Ghoulam**, Adnane Bargaz, **2022**. Screening of potential phosphate solubilizing bacteria inoculants should consider the contrast in P bio-solubilization rate along with plant growth promotion and P use efficiency. Journal of Applied Microbiology, 134 (2). https://doi.org/10.1093/jambio/lxac077

-Nadia Lamsaadi, Ahmed El Moukhtari, Ziati Irouane, Mohammed Mouradi, Majida El Hassni, **Cherki Ghoulam** & Mohamed Farissi, **2022**. Beneficial role of exogenous silicon on yield, antioxidant systems, osmoregulation and oxidative stress in fenugreek (*Trigonella foenum-graecum* L.) under salinity stress. *Silicon*. https://doi.org/10.1007/s12633-022-02034-6

-Oubenali A., El Moukhtari A., Lamsaadi, N., Farssi O., Mouradi, M., Lazali M., Ghoulam C., and Farissi M., 2022. Low phosphorus availability disturbs growth and photosynthetic-related parameters and induced oxidative stress in chickpea (*cicer arietinum* L.). *Applied Ecology and Environmental Research* 20(6):4785-4805. DOI: http://dx.doi.org/10.15666/aeer/2006_47854805

-Bourhim, M.R.; Cheto, S.; Qaddoury, A.; Hirich, A.; **Ghoulam, C., 2022**. Chemical Seed Priming with Zinc Sulfate Improves Quinoa Tolerance to Salinity at Germination Stage. Environ. Sci. Proc. 16, 23. https://doi.org/10.3390/ environsciproc2022016023

-Mouradi Mohammed, Mohamed Farissi, Yahya Lahrizi, Khawla Oukaltouma, Afaf Saaidi, Ahmed Khadraji, Abdelaziz Bouizgaren & Cherki Ghoulam, 2022. Water deficit effects on canopy light interception, chlorophyll fluorescence, and stomatal conductance in Moroccan alfalfa genotypes. *Plant Physiology Reports*, **27**: 469–480. https://doi.org/10.1007/s40502-022-00668-7

-Imane Chamkhi, Said Cheto, Joerg Geistlinger, Youssef Zeroual, Lamfeddal Kouisni, Adnane Bargaz and **Cherki Ghoulam, 2022.** Legume-based intercropping systems: a key to enhance the beneficial rhizobacterial community for crop improvement under stressing conditions. *Industrial Crops & Products* 183,
https://doi.org/10.1016/j.indcrop.2022.114958

-Erick Amombo, Dennis Ashilenje**,** Abdelaziz Hirich, Lamfeddal Kouisni, Abdallah Oukarroum, **Cherki Ghoulam**, Mohamed El Gharous, Abdelaziz Nilahyane, **2022.** Exploring the correlation between salt tolerance and yield; research advances and perspectives for salt-tolerant forage sorghum selection and genetic improvement. *Planta* 255:71 https://doi.org/10.1007/s00425-022-03847-w

- Oukaltouma K., Elmoukhtari A., Lahrizi Y., Makoudi Bouchra, Mouradi M., Farissi M., Willems A., Qaddoury A., Bekkaoui F. and **Ghoulam C., 2022**. Physiological, biochemical and morphological tolerance mechanisms of faba bean (*Vicia faba* L.) to the combined stress of water deficit and phosphorus limitation. *Journal of Soil Science and Plant Nutrition*. DOI 10.1007/s42729-022-00759-2

-Chamkhi Imane, El Omari Nasreddine, Balahbib Abdelaali, El Menyiy Naoual, Benali Taoufiq, **Cherki Ghoulam**, **2021**. Is the rhizosphere a source of applicable multi-beneficial microorganisms for plant enhancement? *Saudi Journal of Biological Sciences. DO - 10.1016/j.sjbs.2021.09.032*

-Elhaissoufi W., **Ghoulam C**., Barakat A., Zeroual Y., Bargaz A**., 2021**. Phosphate bacterial solubilization: a key rhizosphere driving force enabling higher P use efficiency and crop productivity Journal of Advanced Research (*in press*). *https://doi.org/10.1016/j.jare.2021.08.014*

-Farssi Omar, Rabie Saih, Ahmed El Moukhtari, Aziz Oubenali, Mohammed Mouradi, Mohamed Lazali, **Cherki Ghoulam**, Abdelaziz Bouizgaren, Hicham Berrougui, Mohamed Farissi, **2021**. Synergistic effect of Pseudomonas alkylphenolica PF9 and Sinorhizobium meliloti Rm41 on Moroccan alfalfa population grown under limited phosphorus availability. *Saudi Journal of Biological Sciences, https://doi.org/10.1016/j.sjbs.2021.03.069*

- Oukaltouma K., Lahrizi Y., Elmoukhtari A., Farissi M., Mouradi M., Willems A., Qaddoury A., Bekkaoui F. and **Ghoulam C., 2021**. Phosphorus deficiency enhances water deficit impact on some morphological and physiological traits in four faba bean (Vicia faba L.) varieties. *Italian Journal of Agronomy;16:1662 doi:10.4081/ija.2020.1662*

- Lahrizi Y., Oukaltouma K., Mouradi M., Farissi M., Qaddoury A., Bouizgaren A., and **Ghoulam C., 2021.** Seed biopriming with osmo-tolerant rhizobacteria enhances the tolerance of alfalfa (Medicago sativa L.)-rhizobia symbiosis to water deficit. *Applied Ecology and Environmental Research, 19(1):563-580. DOI: http://dx.doi.org/10.15666/aeer/1901_563580*

- Elhaissoufi W., Khourchi S., Ibn Yasser A., **Ghoulam C.,** Rchiad Z., Zeroual Y., Lyamlouly K. and Bargaz A., **2020**. Phosphate Solubilizing Rhizobacteria Could Have a Stronger Influence on Wheat Root Traits and Aboveground Physiology Than Rhizosphere P Solubilization. *Front. Plant Sci. 11:979. doi: 10.3389/fpls.2020.00979*

- Khadraji A., Bouhadi M. and **Ghoulam C., 2020.** Effect of soil available phosphorus levels on chickpea (*Acer arietinum* L.)-rhizobia symbiotic association. *Legume Research, (43):878-88.* DOI:10.18805/LR-524.

-Abdellatif Essahibi, Laila Benhiba, Mohamed Oussouf Fouad, Mohamed Ait Babram, **Cherki Ghoulam**, Ahmed Qaddoury, **2019**. Responsiveness of Carob (*Ceratonia siliqua* L.) Plants to Arbuscular Mycorrhizal Symbiosis Under Different Phosphate Fertilization Levels. *Journal of Plant Growth Regulation (2019) 38:1243–1254* *https://doi.org/10.1007/s00344-019-09929-6*

-Mohamed Farissi, Mohammed Mouradi, Abdelaziz Bouizgaren, & **Cherki Ghoulam. 2018**. Variation in leaf gas exchange, chlorophyll fluorescence and membrane potential root cortex cells of two alfalfa populations under salinity: Assessment of antioxidant potential role in salt tolerance. *Archives of Biological Sciences*,70 (3): 413-423. DOI: 10.2298/ABS171019001F

-Bouchra Makoudi, Ablaa Kabbadj, Mohammed Mouradi, Laurie Amenc, Odile Domergue, Matthew Blair, Jean-Jacques Drevon, **Cherki Ghoulam**. **2018.** Phosphorus deficiency increases nodule phytase activity of faba bean - rhizobia symbiosis. Acta Physiologiae Plantarum. 40 : 63. Thomson Reuters. DOI: 10.1007/s11738-018-2619-6.

-Mohammed Mouradi, Mohamed Farissi, Abdelaziz Bouizgaren, Ahmed Qaddoury & **Cherki Ghoulam. 2018**. *Medicago sativa*-rhizobia symbiosis under water deficit: Physiological, antioxidant and nutritional responses in nodules and leaves. Journal of Plant Nutrition, 41(3): 384-395. DOI: 10.1080/01904167.2017.1385805

-Mohammed Mouradi, Abdelaziz Bouizgaren, Mohamed Farissi, Ahmed Qaddoury & **Cherki Ghoulam. 2018**. Assessment of deficit irrigation responses of Moroccan alfalfa (*Medicago sativa* L.) landraces grown under field conditions. Irrigation and Drainage, 67 (2): 179-190DOI: 10.1002/ird.2190.

-Khadraji A. *and* **Ghoulam C., 2017**. Effect of drought on growth, physiological and biochemical processes of chickpea-rhizobia symbiosis. Legume Research, 40 (1) : 94-99 *DOI:10.18805/lr.v0iOF.3771*

-Ablaa Kabbadj, Bouchra Makoudi, Mohammed Mouradi, Pierre Frendo, Nicolas Pauly, **Cherki Ghoulam**. **2017**. Physiological and biochemical responses involved in water deficit tolerance of nitrogen-fixing *Vicia faba*. PLoS ONE 12(12): e0190284.DOI: 10.1371/journal.pone.0190284.

-Ahmed Khadraji, Mohammed Mouradi, Chafika Houasli, Ahmed Qaddoury, **Cherki Ghoulam**. **2017**. Growth and antioxidant responses during early growth of winter and spring chickpea (*Cicer arietinum* L.) under water deficit as affected by osmopriming. Seed Sciences and Technology 45:1-14.DOI: 10.15258/sst.2017.45.1.16.

-Ahmed Khadraji, Mohammed Mouradi, **Cherki Ghoulam**. **2017**. Growth and Mineral Nutrition of the Chickpea (*Cicer arietinum* L.)-rhizobia Symbiosis under Water Deficit. Brazilian Archives of Biology and Technology, Vol.60: e17160325. DOI:10.1590/1678-4324-2016160325.

-Mohamed Farissi, Mohammed Mouradi, Abdelaziz Bouizgaren, **Cherki Ghoulam**. **2016**. Amélioration de la germination de la luzerne (*Medicago sativa* L.) sous stress salin par traitement pré-germinatif. Fourrages 228, 261-264.

-Mohammed Mouradi, Abdelaziz Bouizgaren, Mohamed Farissi, Ahmed Qaddoury & **Cherki Ghoulam. 2016**. Seed osmopriming improves plant growth, nodulation, chlorophyll fluorescence and nutrient uptake in alfalfa (*Medicago sativa* L.)–rhizobia symbiosis under drought stress. Scientia Horticulturae 213, 232-242. DOI: 10.1016/j.scienta.2016.11.002.

-Mohammed Mouradi, Abdelaziz Bouizgaren, Mohamed Farissi, Bouchra Makoudi, AblaaKabbadj, Anne-Aliénor Very, Hervé Sentenac, Ahmed Qaddoury, **Cherki Ghoulam**. **2016**. Osmopriming improves seeds germination, growth, antioxidant responses and membrane stability during early stage of Moroccan alfalfa populations under water deficit. Chilean Journal of Agricultural Research 76(3), 265-272.DOI: 10.4067/S0718-58392016000300002.

-Mohammed Mouradi, Mohamed Farissi, Abdelaziz Bouizgaren, Bouchra Makoudi, Ablaa Kabbadj, Anne-Aliénor Very, Hervé Sentenac, Ahmed Qaddoury & **Cherki Ghoulam**. **2016**. Effects of water deficit on

growth, nodulation and physiological and biochemical processes in *Medicago sativa*-rhizobia symbiotic association, Arid Land Research and Management, 30 (2), 193-208. DOI: 10.1080/15324982.2015.1073194.

-LahbibLatrach, Mohamed Farissi, Mohammed Mouradi, Bouchra Makoudi, Abdelaziz Bouizgaren and **Cherki Ghoulam. 2014**. Growth and nodulation of alfalfa-rhizobia symbiosis under salinity: electrolyte leakage, stomatal conductance and chlorophyll fluorescence. Turkish Journal of Agriculture and Forestry, 37, 320-326 (Published). DOI: 10.3906/tar-1305-52.

-Abdi N, BargazA, Faghire M, Bouraoui M, HMISSI I, Boulbaba L, **Ghoulam C.,** Sifi B. (**2014**) *Phaseolus vulgaris*-rhizobia symbiosis increases the phosphorus uptake and symbiotic N_2 fixation under insoluble phosphorus. *Journal of Plant Nutrition*, 37:643–657.ISSN: 0190-4167.

- Farissi M., M. Faghire, A. Bargaz, A. Bouizgaren, B. Makoudi, H. Sentenac , and **C. Ghoulam, 2014.** Growth, Nutrients Concentrations, and Enzymes Involved in Plants Nutrition of Alfalfa Populations under Saline Conditions. *Journal of Agricultural Science and Technology, Vol. 16: 301-314. ISSN:*1680-7073.

-Farissi M., **Ghoulam C.,**Bouizgaren A. **2014.** Effet de la salinité sur la production et la qualité fourragère de populations de luzerne dans la région de Marrakech (Maroc)"*Fourrages, 219 : 271-275. ISSN : 0429-2766.*

-Latrach L, Farissi M, Mouradi M, Makoudi B, Bouizgaren A & **Ghoulam C., 2014**. Growth and nodulation in alfalfa-rhizzobia symbiosis under salinity: effect on electrolyte leakage, stomatal conductance and chlorophyll fluorescence**.** Turkish Journal of Agriculture and Forestry, 38: 320-326.ISSN :1300-011X.

-Marney E. Isaac, Georg Carlsson, **Cherki Ghoulam**, Mitalie Makhani, Naresh V. Thevathasan & Andrew M. Gordon, **2014**. Legume Performance and Nitrogen Acquisition Strategies in a Tree-Based Agroecosystem. Agroecology and Sustainable Food Systems, 38:686–703.

- Bargaz A, Lazali M, Amenc L, Abadie J, **Ghoulam C.,** Farissi M, Faghire M, and Drevon J-J (**2013**) Differential expression of trehalose 6-P phosphatase and ascorbate peroxidase transcripts in the root nodule cortex of *P. vulgaris* and the regulation of nodule O_2 permeability. *Planta*, 238:107–11 . ISSN: 0032-0935

- BargazA,Faghire M, Farissi M, Drevon J.J, and **Ghoulam C., (2013)** Oxidative stress in the root nodules of *Phaseolus vulgaris* is induced under phosphorus deficiency. *Acta Physiologiae Plantarum*, 35:1633-1644. ISSN: 1861-1664.

-Mustapha Faghire, Farissi Mohamed, Adnane Bargaz,Btissam Mandri, Khalid Oufdou, Amenc Laurie, **Cherki Ghoulam** and Jean-Jacques Drevon **(2013)** Genotypic variation of nodules' enzymatic activities in symbiotic nitrogen fixation among common bean (*Phaseolus vulgaris* L.) genotypes grown under salinity constraint. *Symbiosis*, 60:115–122. ISSN: 0334-5114**.**

-Farissi M., Bouizgaren A., Faghire M., Bargaz A. & **Ghoulam C. 2013**. Agro-physiological and biochemical properties associated with tolerance of *Medicago sativa* populations to water deficit. *Turkish Journal of Botany*, 37, 1166-1175**.**

- Bouizgaren Abdelaziz, Mohamed Farissi, **Cherki Ghoulam,**RajaeKallida, Mustapha Faghire, Mustapha Barakate and Mohamed Najib Al Feddy (2013). Assessment of summer drought tolerance variability in Mediterranean alfalfa (*Medicago sativa* L.) cultivars under Moroccan fields conditions. *Archives of Agronomy and Soil Science*, 1–14. *ISSN 0365-0340.*

- Farissi M., **Ghoulam C.,**Bouizgaren A. **2013**. Variabilité de la tolérance à la salinité de la luzerne : évaluation au stade germination de populations issues de différents agro-écosystèmes marocains. *Fourrages*, 216, 329-332. *ISSN : 0429-2766.*

- Mandri B, Drevon J-J, BargazA,Oufdou K, Faghire M, Plassard P, Payre H, **Ghoulam C.** (**2012**) Interactions between common bean (*Phaseolus vulgaris*) genotypes and *rhizobia*strains isolated from Moroccan soils for growth, phosphatase and phytase activities under phosphorus deficiency conditions. Journal of *Plant Nutrition* 35, 1477-1490.ISSN: 0190-4167.

- Faghire M, Mandri B, Oufdou K, BargazA,**Ghoulam C.,** Ramírez-Bahena M, Velázquez E, Peix A (**2012**) Identification at species and biovar levels of strains nodulating*P. vulgaris* in saline soils of Marrakesh region (Morocco) and analysis of otsA gene putatively involved in osmotolerance. *Systematic Applied Microbiology.* 35, 156-164.ISSN: 0723-2020

- Bargaz A.,**Ghoulam C.,** Amenc L., Lazali M., Faghire M., Abadie J. and Drevon J-J **(2012)** A Phosphoenol

pyruvate phosphatase gene transcript is induced in the root nodule cortex of *Phaseolus vulgaris* under conditions of P deficiency. *Journal of Experimental Botany*.63, 4723-4730.ISSN: 0022-0957.

-Bargaz A, Drevon J-J, Oufdou K, Mandri B, Faghire M, and **Ghoulam C.** (**2011**) Nodule phosphorus requirement and O_2 uptake in common bean genotypes under phosphorus deficiency. *ActaAgriculturaeScandinavica*, Section B - Plant Soil Science. 61, 602-611. ISSN: 0906-4710

-Bargaz A, **Ghoulam C**, Faghire M, Aslan Attar H, and Drevon J-J (**2011**)The nodule conductance to O_2 diffusion increases with high phosphorus content in the *Phaseolus vulgaris*-rhizobia symbiosis. *Symbiosis*. 53, 157-164. ISSN: 0334-5114.

-Faghire M, BargazA,Farissi M, Mandri B, Palma F, Lluch C, TejeraGarcía N.A, Herrera-Cervera J.A and **Ghoulam C** (**2011**) Effect of salinity on nodulation, nitrogen fixation and growth of common bean (*Phaseolus vulgaris*)inoculated with rhizobia strains isolated from Haouz region of Morocco. *Symbiosis*. 55, 69-75.ISSN: 0334-5114.

- Mohamed FARISSI, Abdelaziz BOUIZGAREN, Mustapha FAGHIRE, Adnane BARGAZ and **Cherki GHOULAM**, 2011. Agro-physiological responses of Moroccan alfalfa (*Medicago sativa* L.) populations to salt stress during germination and early seedling stages. *Seed Science and Technology*39, 389-401.ISSN: 0251-0952.

- Baouch A., El Amrani M., Fares K., **Ghoulam C.**, R'zina Q., Crepeau M.J. and Thibault J.F., 2004. Behaviour of phenolic acids associated with cell wall polysaccharides during sugar beet processing. *International Sugar Journal* 106: 69 – 72

- **Ghoulam C.,** Foursy A. and Fares K., 2002**.** Effect of salt stress on growth, inorganic ions and proline accumulation in relation to osmotic adjustment in sugar beet (*Beta vulgaris* L.). *Environmental and Experimental Botany 47 : 39 - 50.*

-Ghoulam C., 2001. Effets de la salinité sur le rendement et la qualité technologique de la Betterave à sucre: Etude de quelques paramètres biochimiques en relation avec la tolérance des variétés". *Thèse de Doctorat d'Etat, Univ. Cadi Ayyad, Marrakech*

- **Ghoulam C.** and Fares K., 2000. Effect of salinity on seed germination and early seedling growth of sugar beet (*Beta vulgaris* L.). *Seed Science and Technology 29: 357 - 364.*

❖ **Articles published in international journals indexed in other databases:**

-Khadraji Ahmed, Bouhadi Mohammed, **Ghoulam Cherki**, **2023**. Effect of Some Soil Mineral Levels on Their Contents in Different Plant Parts and on the Yield of Chickpea-Rhizobium Symbioses. American Journal of Agriculture and Forestry. Vol. 11, No. 1, 2023, pp. 12-17. doi: 10.11648/j.ajaf.20231101.12

-Khadraji A., Houasli C., **Ghoulam C., 2022**. Effects of Short and Long-Term Hydro priming on Germination Stage and Growth of Some Varieties of Chickpea (Cicer Arietinum L.) Under Drought Stress. J Plant Biol Crop Res.; 5(1): 1054

-Ahmed Khadraji, Mohammed Bouhadi, **Cherki Ghoulam, 2021**. Effect of pH Medium on The Phosphorus Solubilization At Some Isolates of Rhizobium Nodulating Chickpea (Cicer Arietinum L). Journal of Agricultural Research Pesticides and Biofertilizers, 1(1); DOI: http;//doi.org/05.2021/1.1003.

Khadraji Ahmed, Hind El Hari, Chafika Houasli, **Ghoulam Cherki, 2021**,. Effect of Drought on Various Agro-physical Parameters of Chickpea (Cicer arietinum L.) Genotypes in a Field Experiment. Chemical and Biomolecular Engineering. Vol. 6, No. 4, pp. 68-73. doi: 10.11648/j.cbe.20210604.11

-Khadraji A., A. Qaddoury, **C. Ghoulam**, **2020**. Effect of "Halo-priming" on Germination of Chickpea (*Cicer arietinum* L.) under Osmotic Stress. *Indian Journal of Agricultural Research, Volume 54 Issue 6: 797-801*

-Mohammed Mouradi, Mohamed Farissi, Bouchra Makoudi, Abdelaziz Bouizgaren & **Cherki Ghoulam. 2018**. Effect of faba bean (*Vicia faba* L.)–rhizobia symbiosis on barley's growth, phosphorus uptake and acid phosphatase activity in the intercropping system. Annals of Agrarian Sciences 16 (3): 297-303. ISSN: 1512-1887 DOI: 10.1016/j.aasci.2018.05.003

-Mohammed Mouradi, Lahbib Latrach, Mohamed Farissi, Abdelaziz Bouizgaren, & **Cherki Ghoulam**. **2018**. Impact of the Salt Stress on the Agronomic Potential of the Moroccan Populations of Alfalfa (*Medicago sativa* L.) Under the Field Conditions of Marrakesh. Applied Journal of Environmental Engineering Science, 4 N°3:

309-320 **(ISSN: 2509-2065).**

-Mohammed Mouradi, Mohamed Farissi, Ahmed Khadraji & **Cherki Ghoulam. 2018**. Isolation and characterization of phosphate solubilizing rhizobia bacteria nodulating*Vicia faba* L. at the Haouz region of Morocco. Journal of Materials and Environmental Sciences, 9 (9): 2669-2677.

-Mohammed Mouradi, Mohamed Farissi, Ahmed Khadraji, Bouchra Makoudi &**Cherki Ghoulam. 2018**. Biochemical and antioxidant proprieties associated with the adaptation of faba bean (*Vicia faba* L.)-rhizobia symbiosis to phosphorus deficit. Journal of Materials and Environmental Sciences 9(5): 1574-1581. DOI: 10.26872/jmes.2018.9.5.174

-Lahbib Latrach, Mohammed Mouradi, Mohamed Farissi, Abdelaziz Bouizgaren, & **Cherki Ghoulam**. **2017**. Physiological characterization of rhizobial isolates nodulating alfalfa (*Medicago sativa*) isolated from soils of Southeastern Morocco. Applied Journal of Environmental Engineering Science (ISSN: 2509-2065)3(4) 353-364.

-Ahmed Khadraji, Mohammed Mouradi, **Cherki Ghoulam**, **2017**. Phosphate solubilization potential, salinity and drought tolerance of rhizobia nodulating chickpea (*Cicer arietinum* L.). Moroccan Journal of Chemistry 5(4): 722-729.

-Ahmed Khadraji, Mohammed Mouradi, **Cherki Ghoulam**. **2016**. Antioxidant systems, germination and nodulation in chickpea (*Cicer arietinum* L.) genotypes under drought. Moroccan Journal of Chemistry 4:1-14.

-Boudanga L., Farissi M., Bouizgaren A. and **Ghoulam C.,2015**. Growth and nodulation in faba bean-rhizobia symbiosis under different soil phosphorus levels: acid phosphatase and phosphorus deficiency tolerance. Journal Materials and Environment Science, 6 (4) : 997-1003 (Indexé ISSN : 2028-2508)

-Farissi Mohamed, Bouizgaren Abdelaziz, Aziz Faissal, FaghireMustapha and **Ghoulam Cherki**, **2014**.Isolation and screening of rhizobial strains nodulating alfalfa for their tolerance to some environmental stresses. Pacesetter J. Agric. sci. Res. vol. 2(2), pp.9-19.(Indexé ISSN : 2028-9324)

-FARISSI Mohamed, AZIZ Faissal, BOUIZGAREN Abdelaziz, **GHOULAM Cherki, 2014**. La symbiose légumineuses-rhizobia sous conditions de salinité: Aspect agrophysiologique et biochimique de la tolerance. International Journal of Innovation and Scientific Research, 11 (1): 96-104 (Indexé; ISSN 2351-8014).

-Farissi Mohamed, **Ghoulam Cherki**, Bouizgaren Abdelaziz. **2014**. Water deficit effect on yield and forage quality of *Medicago sativa* populations under field conditions in the Marrakesh area of Morocco. Annals of West University of Timişoara, ser. Biology, vol XVII (1), pp.1-8. *(Indexé* ISSN:1453-7680*).*

-Farissi Mohamed, BouizgarenAbdelaziz & **GHOULAM Cherki**. **2014**. Antioxidant responses of alfalfa (*Medicago sativa* L.) nodules to water deficit stress. Annals of Experimental Biology, 2 (4): 16-20 (Indexé ISSN : 2348-1935).

-Bargaz A, **Ghoulam C,** Drevon J-J **(2013).** Specific expression and activity of acid phosphatases in common bean nodules. *Plant Signaling and Behav*ior, 8:8 e25022;http://dx.doi.org/10.4161/psb.25022. Indexé ISSN: 1559-2316

- Farissi M., **Ghoulam C.** and Bouizgaren A., **2013**. Changes in water deficit saturation and photosynthetic pigments of Alfalfa populations under salinity and assessment of proline role in salt tolerance. *Agricultural Science Research Journals 3 (1): 29-35.*(indexé; ISSN-L: 2026-6073).

-Bargaz A, Faghire M, AbdiN,FarissiM**,** Sifi B, CherkaouiIkbal M, Drevon J-J and **Ghoulam C.** (**2012)** Low soil phosphorus availability increases acid phosphatases activities and affects P partitioning in nodules, seeds and rhizosphere of *Phaseolus vulgaris***.** *Agriculture*. 2, 139-153.**Indexé ISSN 2077-0472**

-Abdi N, BargazA,Bouraoui M, Boulbaba L, **Ghoulam C.,** Sifi B (**2012**) Symbiotic responses to insoluble phosphorus supply in common bean (*Phaseolus vulgaris* L.)-Rhizobia symbiosis. *African Journal of Biotechnology*. 19, 4360-4367.ISSN 1684-5315(IF: 0.57)