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Rhizosphere Soil Properties of Peanut (*Arachis hypogaea* L.) Growing Under Field Conditions in Southern Algeria.

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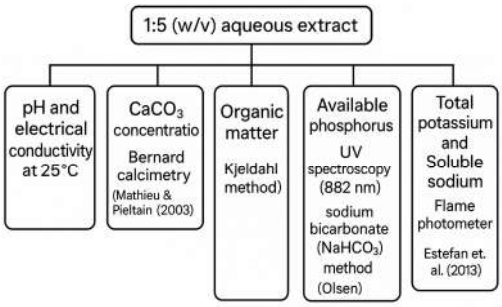
INTRODUCTION & AIM

The rhizosphere, a confined area of soil plant roots, is an intersection of microbial activity and root exudates. Known as the rhizosphere effect, this phenomenon plays a crucial role in crop yield and sustainable agricultural management by providing nutrients, producing beneficial compounds, or controlling pathogens. *Fabaceae* plants play a key role in enhancing soil fertility through organic matter input and symbiotic nitrogen fixation. Peanut (*Arachis hypogaea* L.) is one of the most important oilseed crops grown in the world, particularly in the arid and semi-arid regions of Africa. Its interest lies in the fact that it is an oleo-protein crop with many food and fodder uses (seed, oil, pods and hulls) and that whose culture is growing in Algeria. The present study focused on nutrient bioavailability indications in the rhizosphere of a cultivated peanut Saharan soil, using geostatistical tools to demonstrate spatial variability and variographic analysis that can help with rational fertilization and precision agriculture in these arid zones.

METHOD

Soil samples were obtained from the rhizosphere and bulk soil and subsequently passed through a 2-mm mesh filter and analyzed according to methods described as follows.



The variability maps were generated following auto-kriging of the rhizosphere parameter utilizing R 3.4.2, along with interpolation performed in QGIS 3.34.9, a widely recognized approach for estimating the optimal weighting model. The R 3.4.2 software was utilized to conduct t-tests for paired samples and perform Principal Component Analysis (PCA-Biplot).

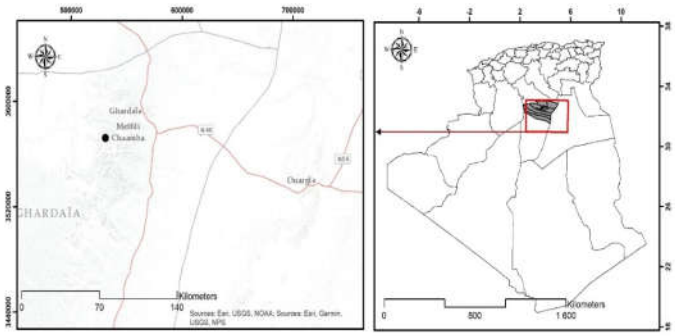


Fig.1. Soil sampling and location of the study area

RESULTS & DISCUSSION

The comparison of soil properties between RS and BS revealed significant differences in pH ($p < 0.0001$), available phosphorus ($p < 0.0001$) and Total nitrogen ($p < 0.0001$). A reduction of 5.52% was noted in pH, an increase of 111% in total nitrogen and 9.98% in available phosphorus in the rhizosphere, compared to the bulk soil. Regarding the negative correlations, there is a significant relationship between pH and OM ($r=-0.56$, $p=0.006$) and between pH and TN ($r=-0.56$, $p=0.007$). For positive correlations, significant relationships were found between EC and SNa ($r=0.62$, $p<0.001$) (Fig. 2, Fig. 3 and Fig. 4)

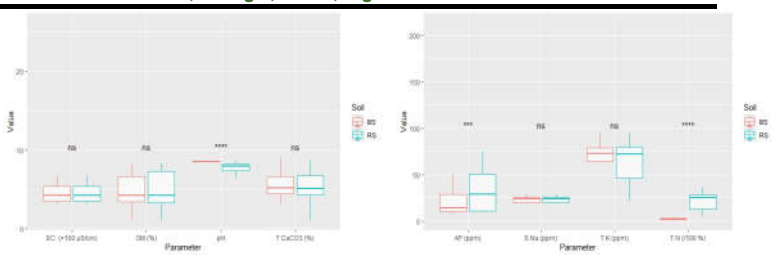


Fig.2. boxplots showing the significant differences between RS and BS,

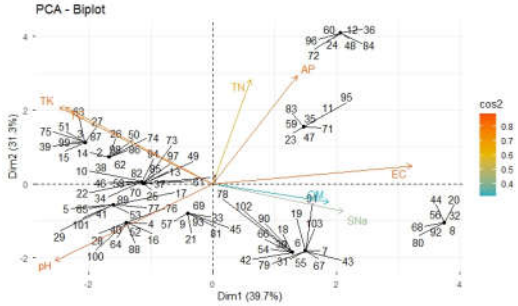


Fig.3. Principal Components Analysis (PCA-biplot) of soil parameters,

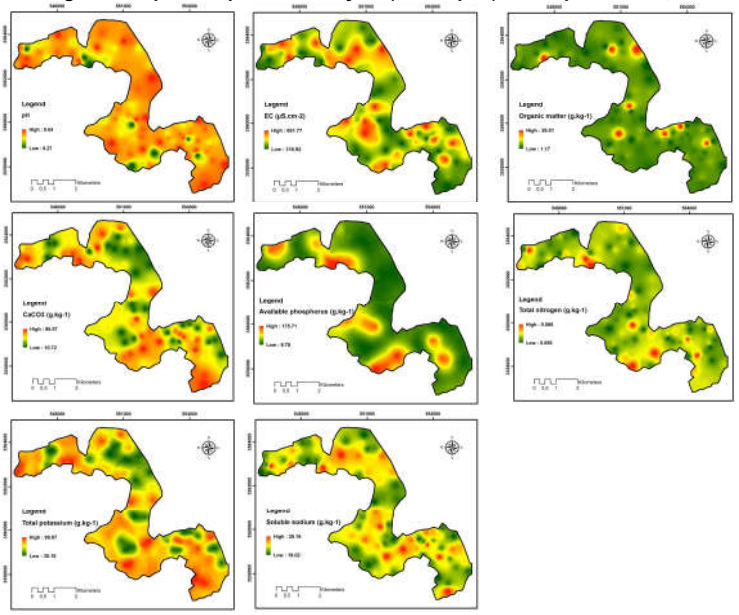


Fig.4. Maps of the rhizosphere soil properties

CONCLUSION

Overall, Peanut plays a key ecological role in acidifying soils and enhancing nutrient availability in arid shrublands. The combination of classical and geostatistical approaches provided valuable insights into multi-scale soil heterogeneity and supports the role of *Fabaceae* shrubs as natural contributors to soil fertility and sustainable land management.

FUTURE WORK / REFERENCES

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