

# SUBSURFACE WATER RETENTION TECHNOLOGY, COMPOST, AND MYCORRHIZAE APPLICATION TO BOOST ARGAN SEEDLINGS BIOCHEMICAL TRAITS UNDER OPEN FIELD CONDITIONS

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## INTRODUCTION

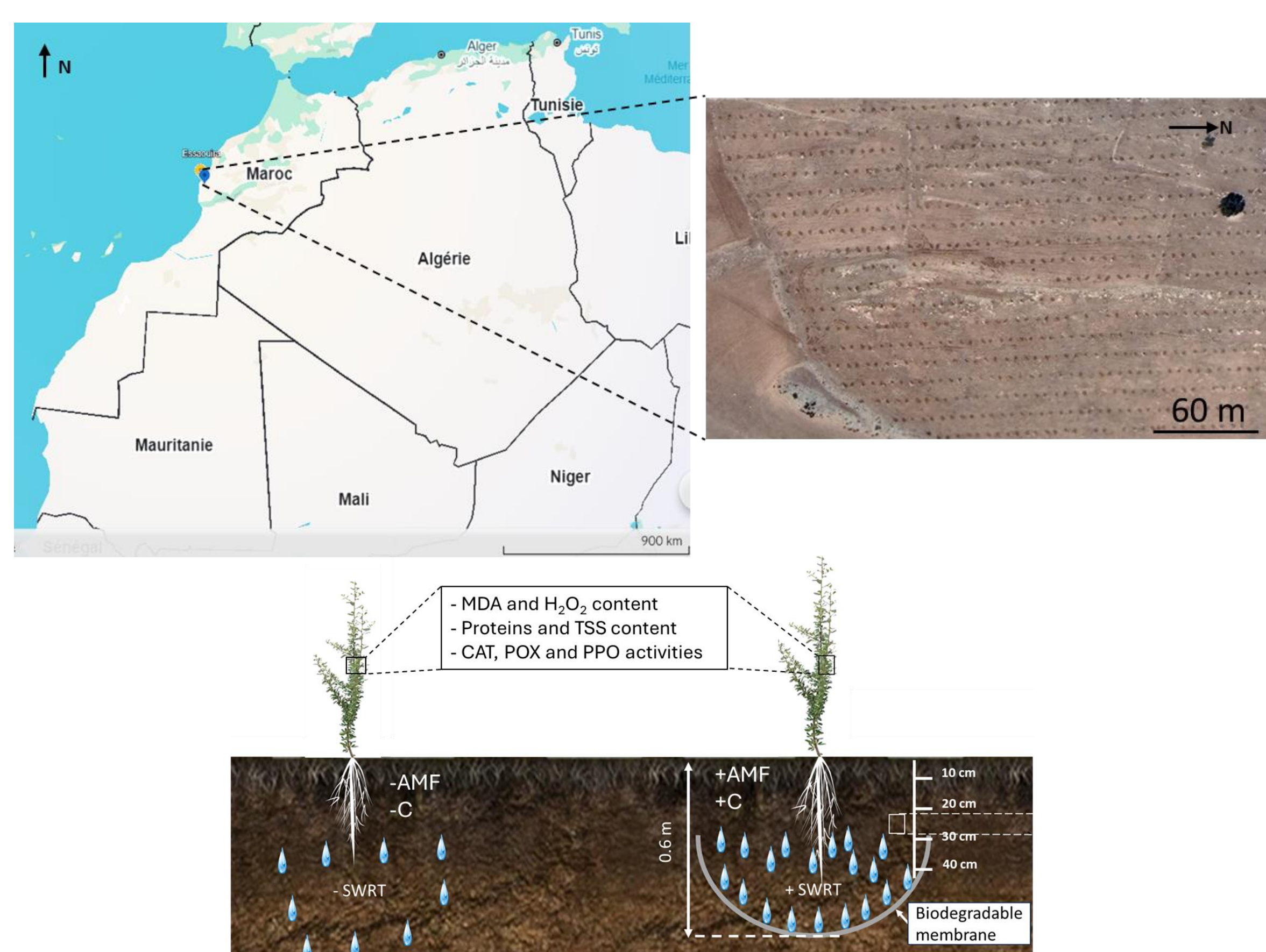
The argan (*Argania spinosa* L. Skeels) ecosystem is severely degrading in arid and semi-arid lands due to climate change, particularly in terms of density loss and reforestation failure. Thus, it is important to adopt innovative effective sustainable practices to optimize the densification and reforestation success of the argan tree.

## OBJECTIVE

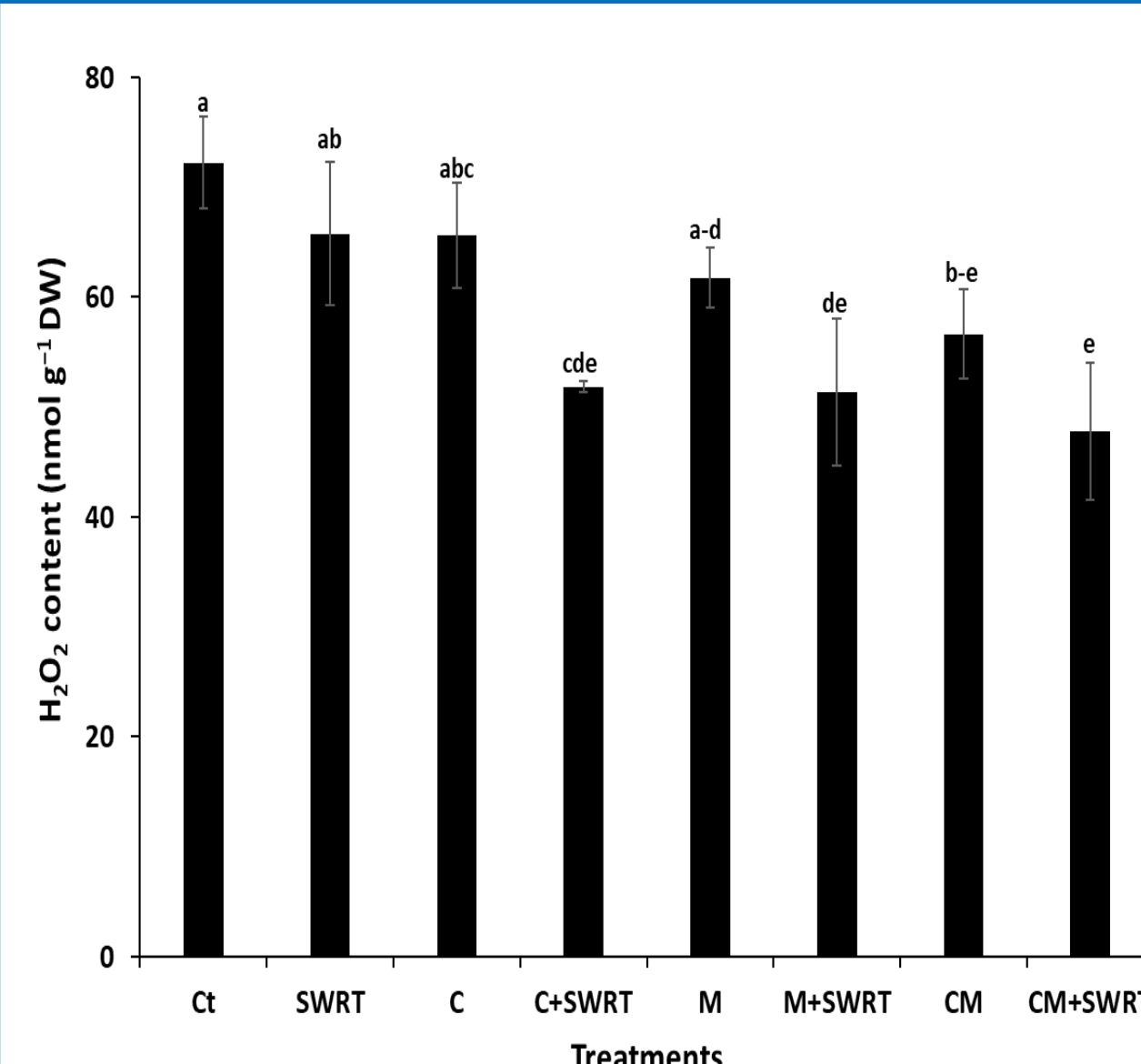
The purpose of the present research was to investigate the combined effect of subsurface water retention technology (SWRT) and the use of compost and native arbuscular mycorrhizal fungi (AMF) on the biochemical parameters of field-grown argan seedlings in the Essaouira region, Morocco.

## MATERIALS AND METHODS

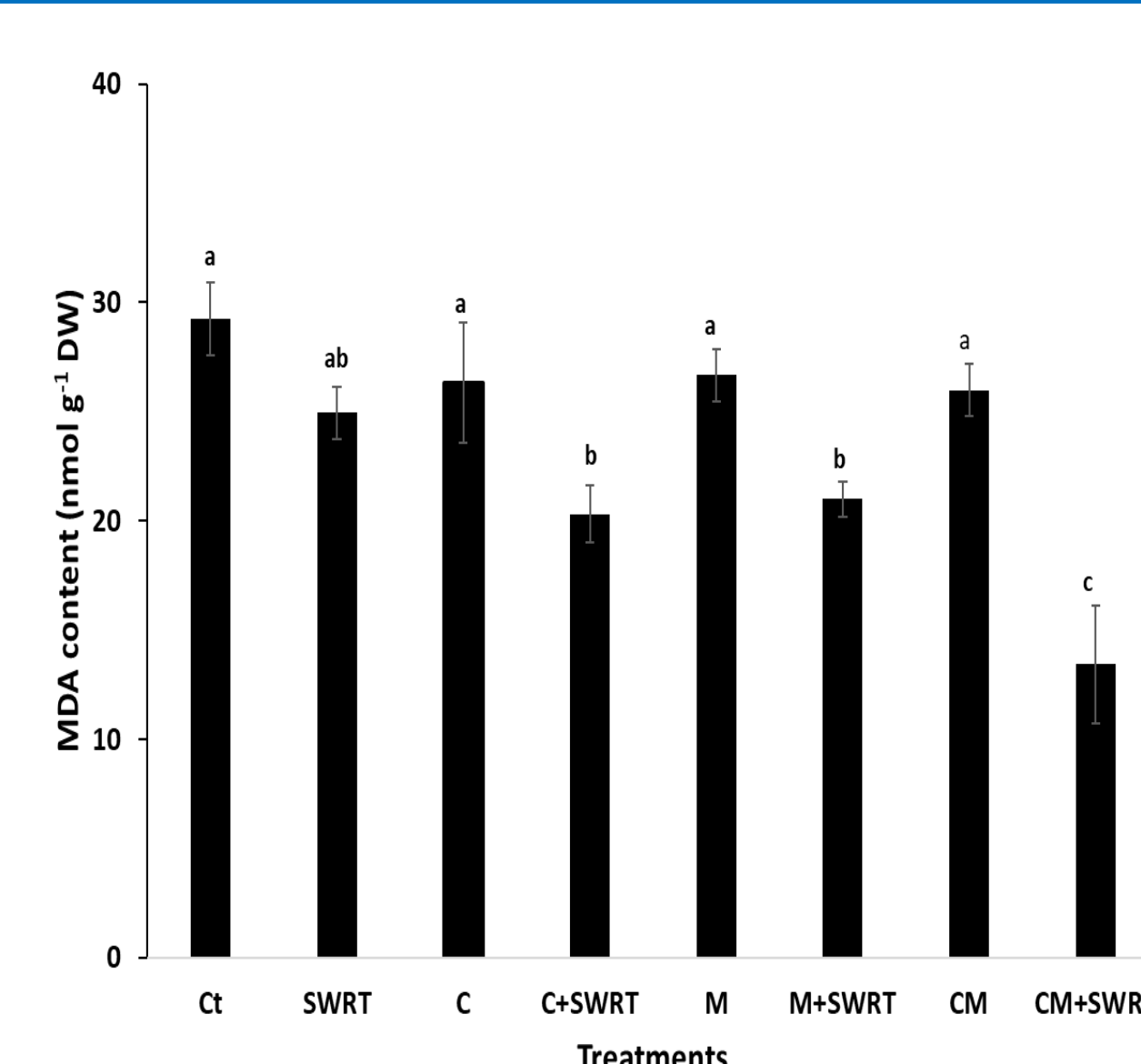
The field experiment was conducted in Id Bouzid douar (31°19'29.3" N 9°32'32.8" W, 360 m above sea level) the Essaouira region, Morocco. In this experiment, one-year-old argan seedlings were transplanted in the absence and presence of SWRT, compost (C), and AMF (M). After one year of transplantation, various biochemical parameters were assessed including: Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) and malondialdehyde (MDA), protein, and total soluble sugars (TSS) contents and polyphenoloxidase (PPO), peroxidase (POX) and catalase (CAT) activities.



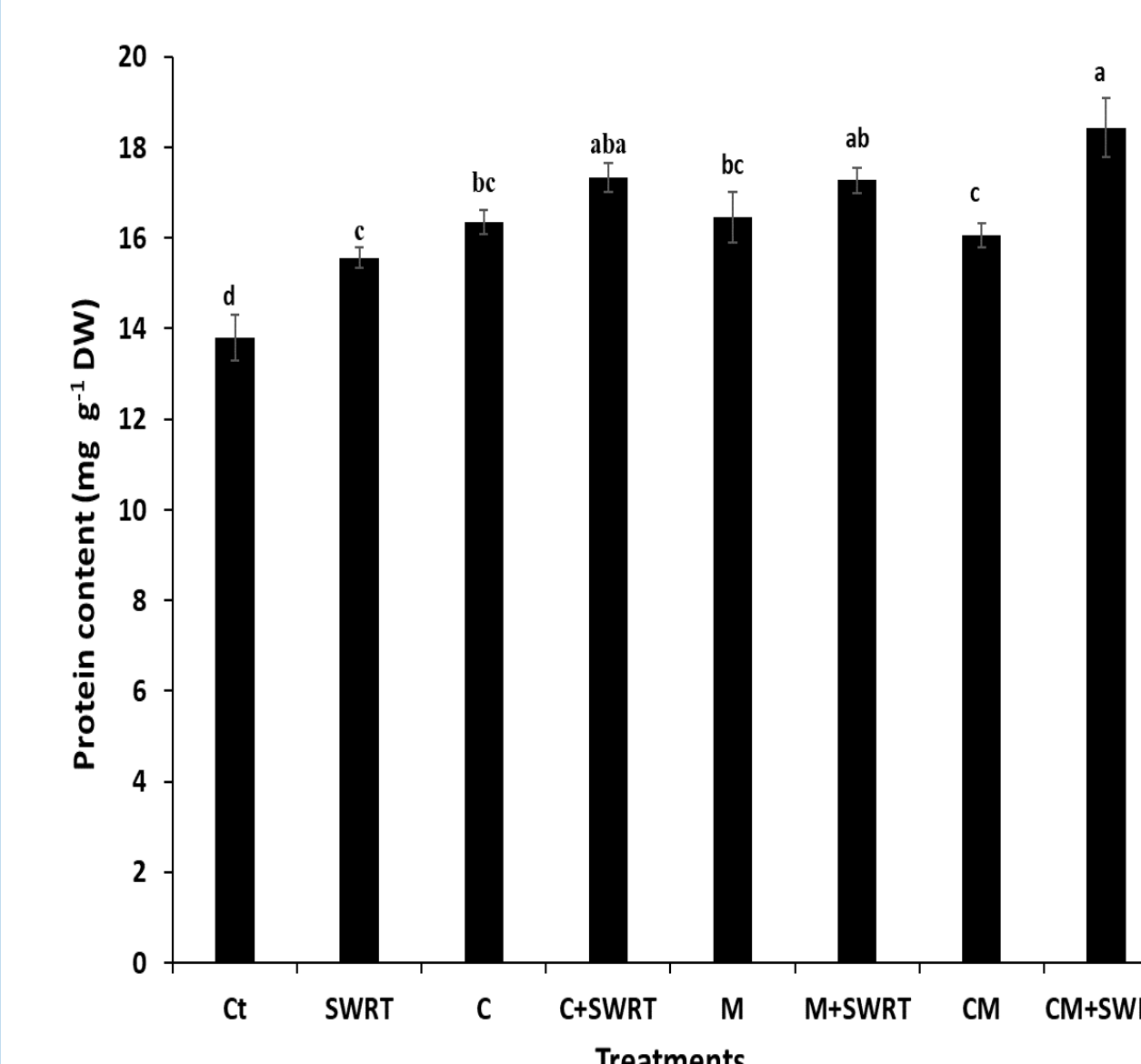
## RESULTS



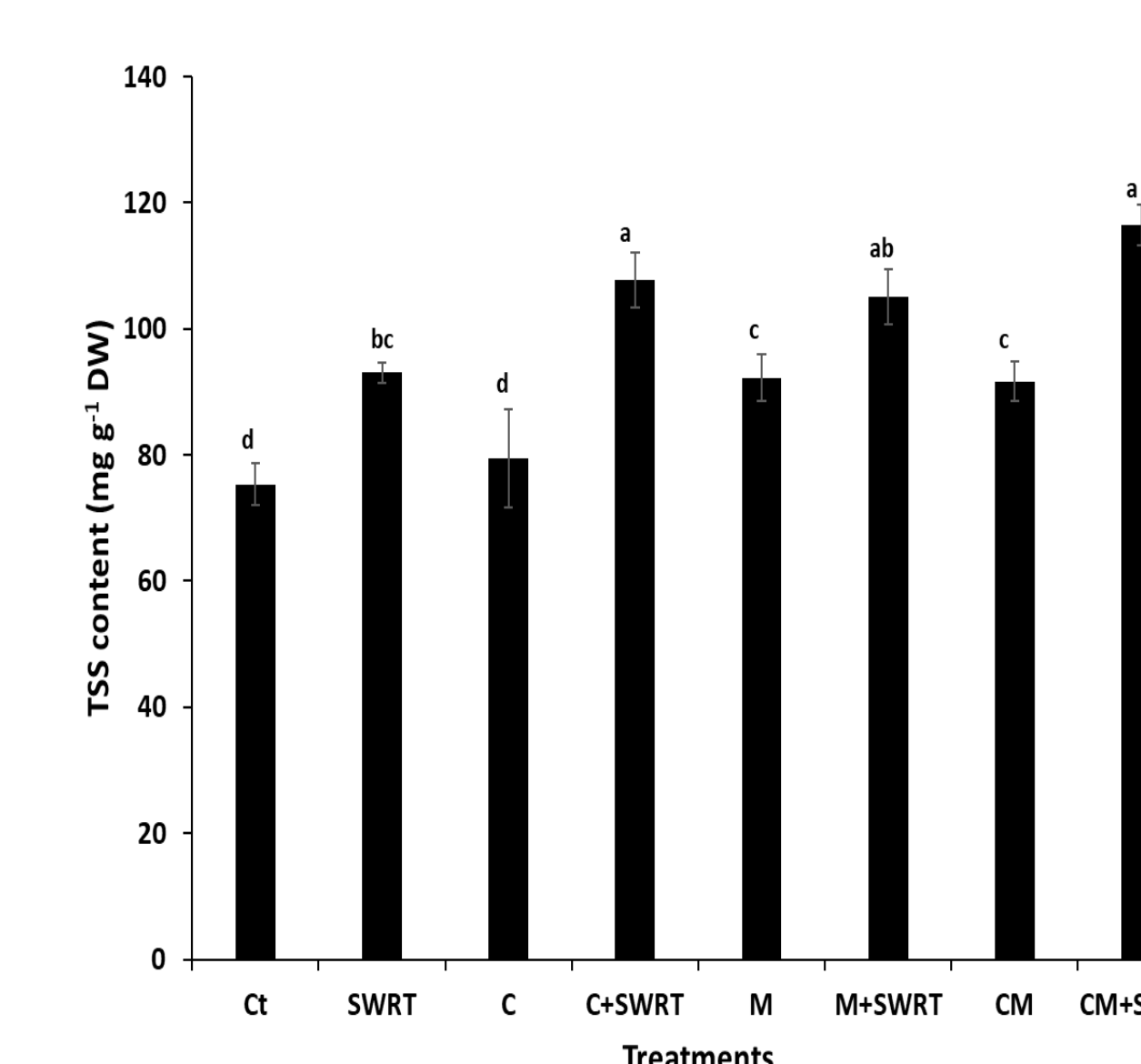
**Figure 1** Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) content of argan seedlings after application of SWRT, compost and AMF alone or in combination



**Figure 2** Malondialdehyde (MDA) content of argan seedlings after application of SWRT, compost and AMF alone or in combination



**Figure 3** Protein content of argan seedlings after application of SWRT, compost and AMF alone or in combination



**Figure 4** Total soluble sugars (TSS) content of argan seedlings after application of SWRT, compost and AMF alone or in combination

## RESULTS

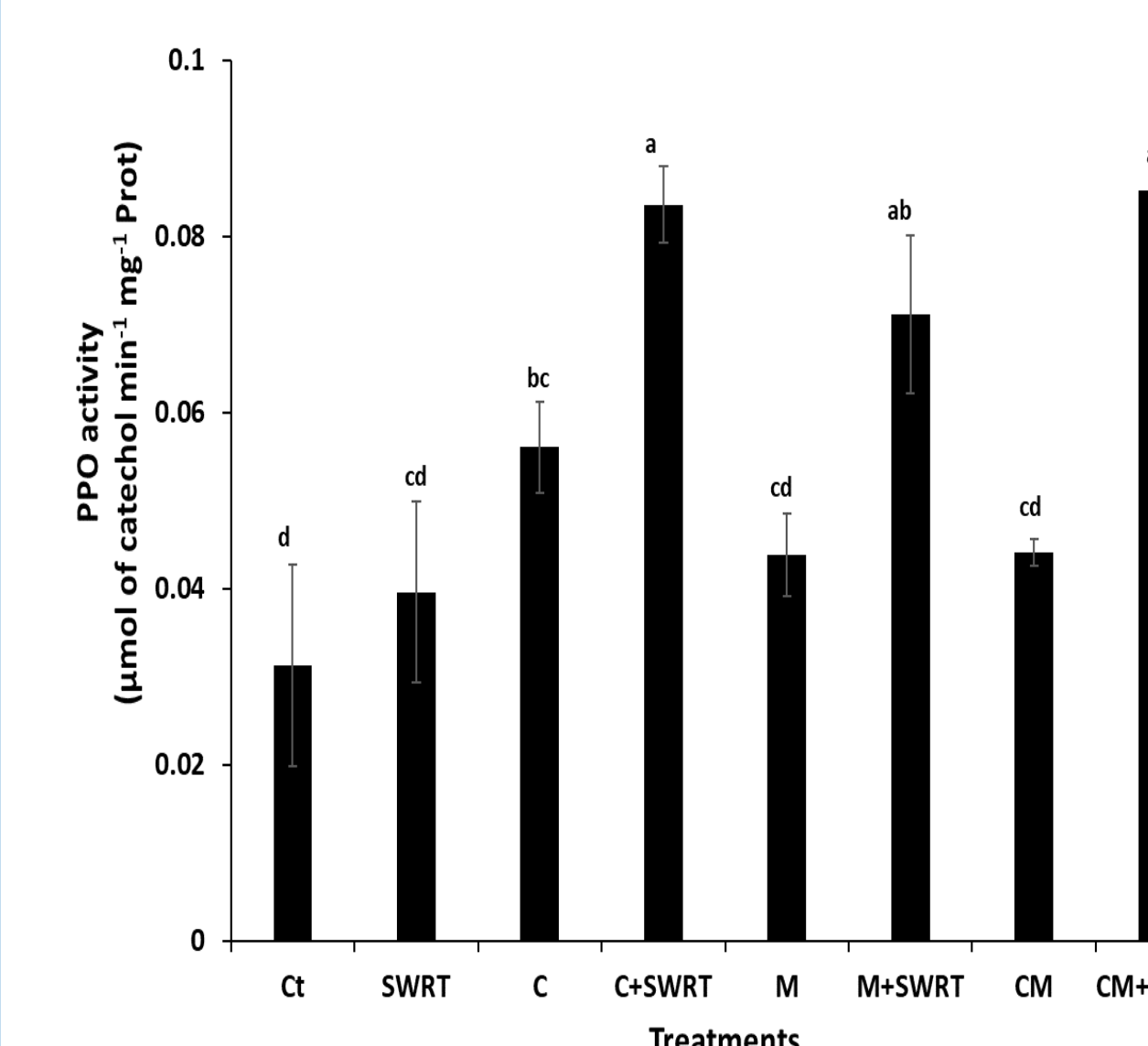
Our findings reveal that the application of these technologies, separately or in combination, induced significant alterations in stress markers and organic osmolytes content and the antioxidant defense of the argan seedlings after one year of transplantation. The combination of the three treatments recorded the lowest values of MDA and H<sub>2</sub>O<sub>2</sub> content in the argan leaves with the greatest decline (55%) recorded for MDA content in comparison to the control. This combination also induced the highest values of proteins and soluble sugars (29 and 55% respectively) content and the activities of the antioxidant enzymes including CAT (37% increase), PPO (166% increase), and POX (100% increase).

## CONCLUSION

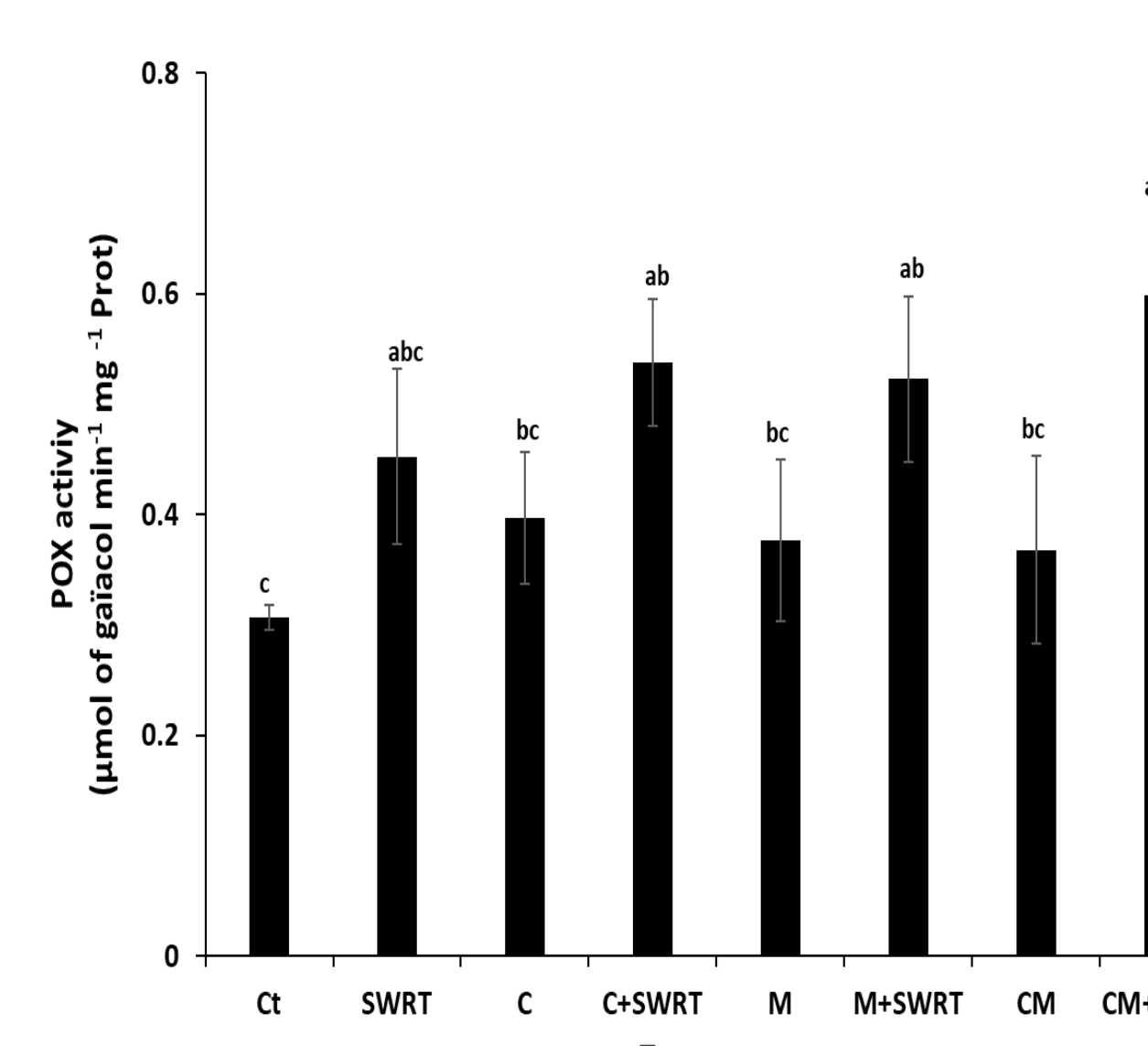
As a summary, the combine application of SWRT, compost, and AMF may be used as a valuable strategy to promote the success of argan reforestation and to limit soil erosion and desertification in arid and semi-arid climates.

## SOCIAL AND POLITICAL IMPACTS

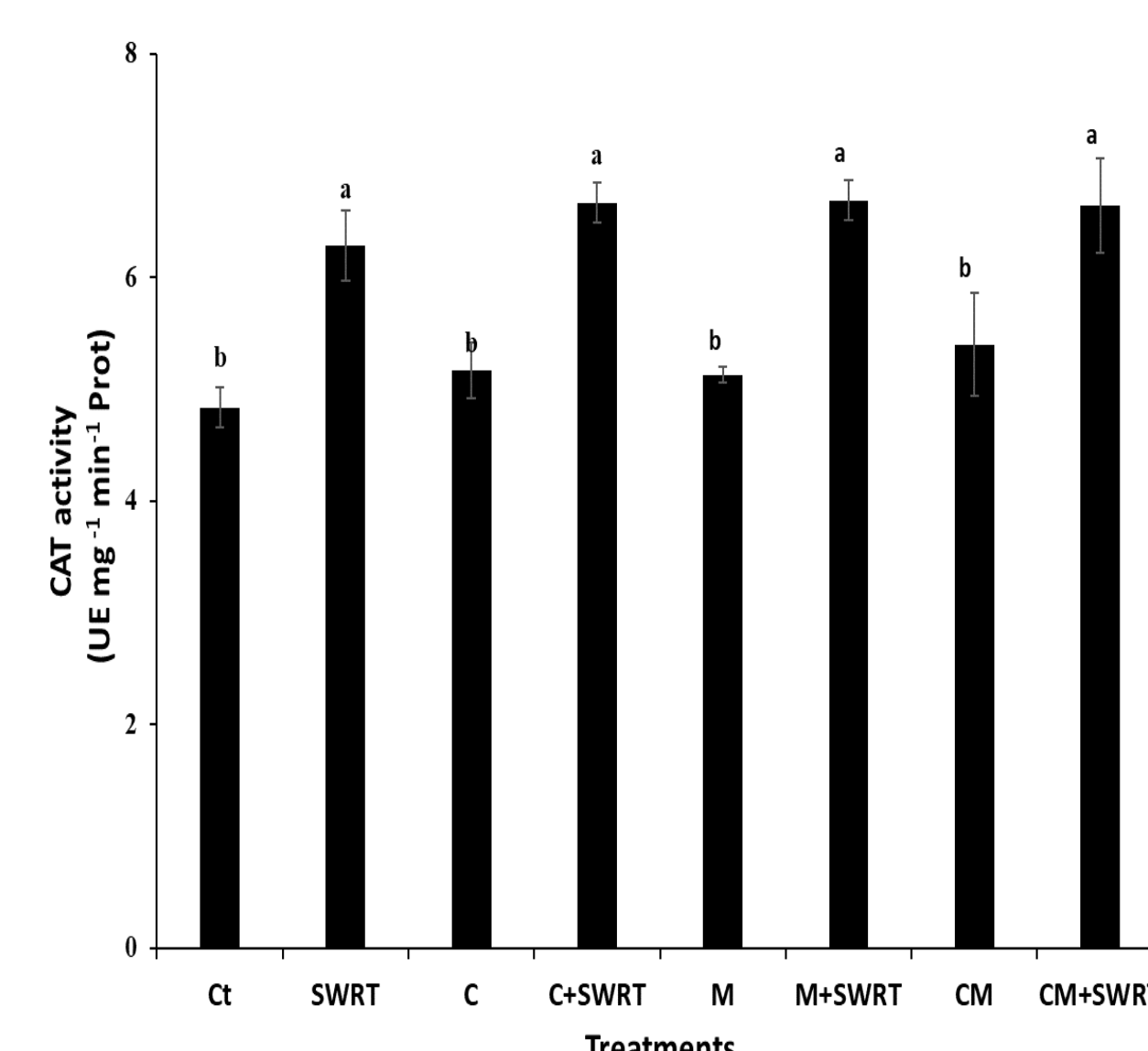
These technologies (SWRT, Compost, and Mycorrhizae) improved the survival and productivity of argan trees, and will increase the income of rural communities, particularly women's cooperatives, and promoting their economic empowerment. Ecologically, they strengthen the fight against desertification and erosion. Politically, their success reinforces national reforestation programs and enhances Morocco's international status as a manager of a Biosphere Reserve. They create green jobs and transfer technical skills, ensuring more sustainable and resilient rural development.



**Figure 5** Polyphenoloxidase (PPO) activity of argan seedlings after application of SWRT, compost and AMF alone or in combination



**Figure 6** Peroxidase (POX) activity of argan seedlings after application of SWRT, compost and AMF alone or in combination



**Figure 7** Catalase (CAT) activity of argan seedlings after application of SWRT, compost and AMF alone or in combination