Research in Pharmacy 2019, 9: 06-08
doi: 10.25081/rip.2019.v9.5715
http://updatepublishing.com/journal/index.php/rip/

Short Communication

ISSN: 2231-539X

Salinity and sodicity influence on Taramira (*Eruca sativa*), A medicinal crop

Muhammad Arshad Ullah[1]*, Muhammad Rasheed[2], Imdad Ali Mahmood[1]

[1]Land Resources Research Institute, National Agricultural Research Centre, Islamabad 45500, Pakistan
[2]PMAS - Agronomy Department, University of Arid Agriculture, Rawalpindi, Punjab, Pakistan

Received: April 12, 2019
Accepted: July 01, 2019
Published: July 04, 2019

***Corresponding Author:**
Muhammad Arshad Ullah
Email: arshadullah1965@gmail.com

ABSTRACT

Seeds of Taramira (*Eruca sativa*) as medicinal plant were sown in a pot study under various salinity cum sodicity levels. Out of different levels tested, 4 dSm^{-1}+ 13.5 $(mmol\ L^{-1})^{1/2}$ treatment got maximum biomass yield (34 $gpot^{-1}$). It was declined due to salinity increase. At 10 dSm^{-1} + 30 $(mmol\ L^{-1})^{1/2}$ minimum biomass yield (22.33 $gpot^{-1}$) was gotten. Results also indicated decrease (%) of biomass yield over lowest level of salinity cum sodicity. Least reduction % over control (15.73) was attained by 5 dSm^{-1} + 25 $(mmol\ L^{-1})^{1/2}$ treatment showing better tolerance. Growth least reduction % over control was ranging from 15.73% to 34.32% due to toxic salts. This variation was linked with toxic influence of salts on plant growth. At the nutshell, Taramaria (*Eruca sativa*) was produced maximum growth under 4 dSm^{-1}+ 13.5 $(mmol\ L^{-1})^{1/2}$.

KEY WORDS: Taramira, saline- sodic, medicinal value and biomass yield

INTRODUCTION

Damages to health were appeared due to haphazard medicinal use from synthetic drugs [1-4]. Medicinal plants utilization in medicine is based on experimental information collected over the centuries relating to plant trial in numerous racial groups [5]. Therefore, the production and exchange of phytotherapeutic agents raise many queries for the standardization techniques [6].

Eruca sativa Miller is as a fresh-cut vegetable is appropriate growing in bung trays [7]. According to D'Antuono *et al.* [8], *Eruca sativa* is a new prospective health promoting vegetable due to the glucosinolates content. Rocket namely rucola (*Eruca sativa* (L.) Mill.) is usually grown in the Mediterranean region. It is painstaking to be superb stomachic refreshment due to its exceptional dietetic properties; especially for glycosides content, mineral salts and vitamin C [9,10]. *E. sativa* seed oil having antioxidant and antimicrobial qualities utilize to restrain the tumour growth propagation [11,12].

Salt affected land causes economic difficulties to poor farmers by poor growth of plants and decreased production [13,14]. FAO [15] reported 831 million hectares as globally total area of salt-affected soils which comprises of 397 mha saline and 434 mha sodic soils. Population pressure, undesirable environmental circumstance, natural calamities, and global climate change are regularly decreasing agricultural land [16]. Salts affected in excess of 45 million hectares irrigated land that is equal to 20% of total land and approximately1.5 m ha of land are out of production each year due to high salinity [17,18]; if this condition retains, 50% of cultivable lands will be changed to uncultivable in the middle of 21st century [19].

Nearly all *Brassica* species classified as moderately salt tolerant, through considerable interspecific and intraspecific differences for salt tolerance [20]. Santos *et al.* [21] investigated that the fresh biomass was inversely proportional to increase salinity levels. Jesus *et al.* [22] found that increasing salinity reduced the fresh and dry mass of the leaves, roots, and protein content, except proline content was increased and enzyme activity change took place during this period in two rocket cultivars.

Taramaria declines leaf expansion and photosynthesis and all other photosynthesis process [23]. Different aspects of natural and anthropogenic factors are responsible for salinity in agricultural soils [24,25]. Plants having ability to absorb salts from salt-affected soils investigated and acknowledged [26-28]. Halophytes are plants that may endure, imitate and competent of carrying out their life cycle salt concentration environments above 200mM of NaCl [28,29]. They are too named as euhalophytes owing to enhance yield at maximum salinity and perform better under saline environment than fresh water [30]. These plants can be an alternate for conventional crops in high salt concentration land/water and are excellent food, fuel, fodder, fiber, essential oils, and medicine supply [31]. At the same time, halophytes may be subjugated as noteworthy and main plant species posture potential desalination/restoration quality in saline soils and phytoremediation. These valuable procedures can be brought under cultivation unused and marginal land will open a new door to keep up crop yield. Considering the above facts, we have planned to introduce Taramaria in salt- affected environment as medicinal plant.

MATERIALS AND METHODS

To assess the salt tolerance of Taramira (*Eruca sativa*) as medicinal plant under different saline and sodic concentrations a pot experiment was planned at green house of Land Resources Research Institute, National Agricultural Research Centre, Islamabad, Pakistan during, 2017. The soil used for the pot experiment was analysed [7. 8 pH_s, 2.1 ECe (dSm^{-1}), 4.7 SAR ($mmol\ L^{-1})^{1/2}$, 23.1 Saturation Percentage (%), 0.40 O.M. (%), 7.4 Available P (mg Kg^{-1}) and 97.8 Extractable K (mg Kg^{-1})]. Keepin in view the pre- sowing soil analysis the ECe (Electrical conductivity) and SAR (Sodium Absorption Ratio) were developed with the addition of NaCl, $Na_2\ SO_4$, $CaCl_2$ and $MgSO_4$ salts using Quadratic Equation.10 Kg soil was used to fill each pot. 10 seeds of Taramira (*Eruca sativa*) as medicinal plant were sown in each pot. Fertilizer was applied @60-50-40 NPK Kg ha^{-1}. Treatments were [4 dSm^{-1}+ 13.5 (mmol $L^{-1})^{1/2}$, 5 dSm^{-1} + 25 (mmol $L^{-1})^{1/2}$, 5 dSm^{-1} + 30 (mmol $L^{-1})^{1/2}$, 10dSm^{-1} + 25 (mmol $L^{-1})^{1/2}$, 10dSm^{-1} + 25 (mmol $L^{-1})^{1/2}$ and 10 dSm^{-1} + 30 (mmol $L^{-1})^{1/2}$)]. Completely randomized deign was applied with three repeats. Biomass yield were collected at the harvest of plants. Data were statistically analysed and means were compared by LSD at 5 % [32].

RESULTS AND DISCUSSIONS

Approximately 20% of our agricultural lands are damaged by salt toxicity. In order to exploit the salt affected lands through a bio saline approach, a pot study was designed to evaluate the salt tolerance of Taramaria (*Eruca sativa*). Significant difference was found among treatments on biomass yield (Table-1). Highest biomass yield (34 $gpot^{-1}$) was attained by 4 dSm^{-1}+ 13.5 (mmol $L^{-1})^{1/2}$ treatment. Biomass yield was decreased as well as the toxicity of salts was increased. Lowest biomass yield (22.33 $gpot^{-1}$) was produced at 10 dSm^{-1} + 30 (mmol $L^{-1})^{1/2}$. Santos *et al.* [21] stated that increasing salinity levels decreased the fresh biomass.

Table-1 also explored the % decrease in biomass yield over control. 5 dSm^{-1} + 25 (mmol $L^{-1})^{1/2}$ treatment performed better results i.e. the least reduction % over control (15.73). Salinity- sodicity showed serious effect on the growth reduction from 15.73 % to 34.32%. This huge gap was addressed by the negative effect of more salt concentration on Taramaria growth. Jesus *et al*. [22] reported that, in two rocket cultivars, increasing salinity reduced the fresh and dry mass of the leaves, roots.

Table 1: Influence of various salinity and sodicity levels on biomass yield of Taramira (*Eruca sativa*) as medicinal crop

Treatments	Biomass yield ($gpot^{-1}$)	% decrease over control
4 dSm^{-1}+13.5 (mmol $L^{-1})^{1/2}$	34.00a	-------
5 dSm^{-1}+25 (mmol $L^{-1})^{1/2}$	28.65ab	15.73
5 dSm^{-1}+30 (mmol $L^{-1})^{1/2}$	26.77bc	21.26
10dSm^{-1}+25 (mmol $L^{-1})^{1/2}$	24.99c	26.50
10 dSm^{-1}+30 (mmol $L^{-1})^{1/2}$	22.33cd	34.32
LSD at 5%	3.42	

CONCLUSION

Based on the findings, Taramaria (*Eruca sativa*) was able to grow the highest at 4 dSm^{-1}+ 13.5 (mmol $L^{-1})^{1/2}$ treatment. Therefore, Taramaria is suggested to be cultivated in farmlands which are relatively faced with the problem of soil salinity.

REFERENCES

1. Celik TA, Aslantürk OS. Anti-mitotic and anti-genotoxic effects of *Plantago lanceolata* aqueous extracts on *Allium cepa* root tip meristem cells. Biologia. 2006; 61:693–697.
2. Celik TA, Aslantürk OS. Cytotoxic and genotoxic effects of *Lavandula stoechas* aqueous extracts. Biologia, 2007; 62: 292–296.
3. Pugliesi GC, Andrade SF, Bastos JK, Maistro EL. *In vivo* clastogenicity assessment of the *Austroplenckia populnea* (Celastraceae) leaves extract using micronucleus and chromosomes aberration assay. Cytologia, 2007; 72: 1–6.
4. Lubini G, Fachinetto JM, Laughinghouse HD, Paranhos JT, Silva ACF, TedescO SB. Extracts affecting mitotic division in root-tip meristematic cells. Biologia, 2008; 63: 647–651.
5. Nunes WB, Carvalho S. Avalia.o dos efeitos clastogênicos do algod. ozinho-do-campo-*Cochlospermun regium* (Mart ex Schrank) pilger, em células germinativas de *Drosophila melanogaster*. Genet Mol Biol, 2003; 26: 545–549.
6. Negrelle RR, Gomes EC. *Cymbopogon citratus* (DC) Stapf: Chemical Composition and Biological Activities. Revista Brasileira De Plantas Medicinais*,* Botucatu, 2007; 9(1):80-92.
7. Guerra MJM, Badell JB, Albajés ARR, Pérez HB,Valencia RM, Azcuy AL. Toxicologic acute evaluation of the fluid extracts 30 and 80 porciento of *Cymbopogon citratus* (D.C.) Stapf (lemon grass). Rev Cub Plantas Med, 2000; 5: 97–101.
8. D'Antuono L.F, Elementi S, Neri R. Exploring new potential health-promoting vegetables: glucosinolates and sensory attributes of rocket salads and related Diplotaxis and Eruca species. Journal of the Science of Food and Agriculture, 2009;89: 713-722
9. Alqasoumi S, Al-Sohaibani M, Al-Howiriny T, Al-Yahya M, Rafatullah S. Rocket '*Eruca sativa*': A salad herb with potential gastric anti-ulcer activity. World Journal of Gastroenterology, 2009; 15: 1958–1965.
10. Katsarou D, Omirou M, Liadaki K, Tsikou D, Delis C, Garaqounis C, Krokida A, Zambounis A, Papadopoulou KK. Glucosinolate biosynthesis in *Eruca sativa*. Plant Physiology and Biochemistry, 2016; 09: 452-466.
11. Kefu Z, Hai F, Ungar I A. Survey of halophyte species in China. *Plant Science*. 2002; 63(3):491–498.
12. Azarenko O, Jordan MA, Wilson L. Erucin, the major isothiocyanate in arugula (*Eruca sativa*), inhibits proliferation of MCF7 tumor cells by suppressing microtubule dynamics. Plos One, 2014; 9: e100599.
13. Abdel-Dayem S. Understanding the social and economic dimensions of salinity. In Proceedings of the International Salinity Forum, 25–27 April 2005, Riverside, California. 2005; 1–4.
14. Qadir M, Noble AD, Oster JD, Schubert S, Ghafoor A. Driving forces for sodium removal during phytoremediation of calcareous sodic soils. Soil Use and Management. 2005; 21:173–180.
15. FAO. Global network on integrated soil management for sustainable use of salt-affected soils. 2000.
16. Hasanuzzaman M, Nahar K, Fujita M. Plant response to salt stress and role of exogenous protectants to mitigate salt induced damages, in Ecophysiology and Responses of Plants Under Salt Stress, Ahmad P, Azooz MM, Prasad MNV. Eds. 2013.
17. pp. 25–87, Springer, NewYork, NY,USA. Pitman MG, L¨auchli A. Global impact of salinity and agricultural ecosystem, in *Salinity: Environment PlantsMolecules*, A. L¨auchli and U. L¨uttge, Eds., pp. 3–20, Kluwer Academic, Dodrecht, The Netherlands.2002.

18. Santin, MR, Dos Santos AO, Nakamura CV, Filho BPD, Ferreira ICP, Ueda-Nakamura T. In vitro activity of the essential oil *of Cymbopogon citratus* and its major component (citral) on *Leishmania amazonensis*. Parasitol. Res. J. 2009; 105:1489–1496.
19. Mahajan S, Tuteja N. Cold, salinity and drought stresses: an overview, *Archives of Biochemistry and Biophysics*. 2005; 444(2): 139–158.
20. Ashraf M, McNeilly T. Salinity tolerance in Brassica oilseeds. *Crit. Rev. Plant Sci.,* 2004; 23(2): 157-174.
21. Santos RSS, Dias NS, Duarte SN, Lima CJGS. Use of brackish water in the production of rocket cultivated in coconut fiber substrate. Revista Caatinga, 2012; 25: 113–118.
22. Jesus CG, Silva FJJr, Camara TR, Silva EFF, Willadino L. Production of rocket under salt stress in hydroponic systems. Horticultura Brasileira, 2015; 33: 493–497.
23. Tavakkoli E, Fatehi F, Coventry S, Rengasamy P, McDonald GK. Additive effects of Na and Cl- ions on barley growth under salinity stress. J Exp Bot. 2011; 62:2189-2203.
24. Munns R. Genes and salt tolerance: bringing them together. New Phytol. 2005;167:645-663
25. Najafian S, Khoshkhui M, Tavallali V, SaharkhizM J. Effect of salicylic acid and salinity in thyme (*Thymus vulgaris* L.): investigation on changes in gasex change, water relations, and membrane stabilization and biomass accumulation. *Australian* Journal of Basic and Applied Sciences*,* 2009; 3, 2620-2626.
26. Cha-um S, Pokasombat Y, Kirdmanee C. Remediation of salt affected soil by gypsum and farmyard manure—Importance for the production of Jasmine rice. Aust J Crop Sci, 2011; 5: 458-465.
27. Ashraf MY, Akhtar K, Sarwar G, Ashraf M. Role of the rooting system in salt tolerance potential of different guar accessions. *Agron. Sustainable Dev.* 2005; 25(2): 243-249.
28. Nicola S, Hoeberechts J, Fontana E. Rocket (*Eruca sativa* Mill.) and corn salad (*Valerianella olitoria* L.): Production and shelf-life of two leafy vegetables grown in a soilless culture systems. Acta Horticulturae, 2004; 633: 509-516
29. Flowers TJ, Colmer TD. Salinity tolerance in halophytes. New Phytologist, 2008; 179: 945–963
30. Yensen N P. Halophyte uses for the twenty-first century, in *Ecophysiology of High Salinity Tolerant Plants*, M. A. Khan and D. J.Weber, Eds., 2008. pp. 367–396.
31. Lokhande V H, Suprasanna P. Prospects of halophytes in understanding and managing abiotic stress tolerance. in *Environmental Adaptations and Stress Tolerance of Plants in the Era of Climate Change*, P. Ahmad and M. N. V. Prasad, Eds., pp. 29–56, Springer, NewYork, NY, USA. 2012.
32. Montgomery D C. Design and Analysis of Experiments (5th Ed.) John Willey and Sons, New York, USA. 2001. p. 64-65.