
**E-ISSN:** 2618-0618
**P-ISSN:** 2618-060X

www.agronomyjournals.com
2024; SP-7(10): 773-775
Received: 01-08-2024
Accepted: 06-09-2024

**DK Borse**
Department of Agronomy, College of Agriculture, Dapoli, Ratnagiri, Maharashtra, India

**SS Pinjari**
Agricultural Research Station, Dist- Palghar Maharashtra, India

**NV Mhaskar**
Regional Agricultural Research Station, Karjat, Dist. Raigad Maharashtra, India

**MR Wahane**
Khar Land Research Station, Panvel, Dist- Raigad Maharashtra, India

**PS Bodake**
Departments of Agronomy, Mahatma Phule Krishi Vidyapeeth, Rahuri, A.nagar, Maharashtra, India

**Corresponding Author:**
**DK Borse**
Department of Agronomy, College of Agriculture, Dapoli, Ratnagiri, Maharashtra, India

# Performance of different leafy vegetables under coastal saline soil of *Konkan* Region of Maharashtra State of India

**DK Borse, SS Pinjari, NV Mhaskar, MR Wahane and PS Bodake**

**DOI:** https://doi.org/10.33545/2618060X.2024.v7.i10Sk.1902

**Abstract**
Field experiments were carried out on different leafy vegetables during the *Rabi* seasons of 2018, 2019 and 2020 at Khar Land Research Station, Panvel, Dist. Raigad (Maharashtra) with the objective to assess performance of leafy vegetables under Coastal Saline Soil Condition of North Konkan region of Maharashtra state. The experiment was laid out in 4 time replicated randomized block design, assigning 5 leafy vegetables, *viz*. Spinach, Fenugreek, Coriander, Radish and Amaranths. From three years pooled data revealed that among the different leafy vegetables, the *Spinach* recorded significantly higher yield (69.94 q $ha^{-1}$) than the rest of the vegetables except *Radish* crop (56.14 q $ha^{-1}$) which was at par with it, lowest yield was recorded from *coriander* (38.05 q $ha^{-1}$). The maximum productivity and profitability efficiency was noted in *Radish* which were 140.35 kg/ha/day and Rs. 899.13/ha/day respectively.

**Keywords:** Leafy vegetables, Leaf yield, Profitability, Coastal Saline soil etc.

## Introduction
The coastal salt affected saline soils are problematic soils which contain higher amount of soluble salts concentration with electrical conductivity more than 4 d $Sm^{-1}$. In India area under coastal salt affected saline soils is about 1.24 million hectares, out of that nearly 0.065 million hectare area lies in Maharashtra state (Patil *et al.,* 2016) [7]. The average annual rainfall in coastal area is about 2500 to 3000 mm. in these coastal salt affected area rice is only alternative crop to withstand adverse conditions during *Kharif* season, while in *rabi* and *summer* season as soil become dry the salt concentration is increases in field due to capillary movement and percolation which creates unavailability of good quality water for irrigation ultimately restrict the crop diversification. Therefore most of the saline soils are under mono cropped system which affect the economic status of farmers of coastal region (Mondal *et al.,* 2006) [4]. The choice of crops to be grown in salt affected soils is very important to obtain acceptable yields. The salinity tolerance of any crop is defined as the ability to endure the effects of excess salt in the root zone. Salt tolerance is described by models that relate the decrease in relative production with the increase in soil salinity (Maas and Hoffman., 1977) [3]. This also decides cropping systems as well as favourable diversification to meet the other requirements of farm families.The classes of salt tolerance are: sensitive, moderately sensitive, moderately tolerant, tolerant, and unsuitable for crops. The majority of vegetable crops are sensitive or moderately sensitive (Hanson *et al.,* 2006) [2] The growing of salt tolerant leafy vegetables mitigates problems related to crop diversification, nutritional food security and economic status of the farmers of coastal salt affected area. Theses leafy vegetables like *Spinach, Raddish, Amaranthus* etc. has high nutritive values and has a high content of dietary fibre and vitamins as well as mineral components (Natesh *et al.,* 2017) [5]. However, very less information reported on response of leafy vegetables for their salt tolerance and yield in coastal saline soil of *Konkan* region. Keeping with these points, the study were carried out on performance of different leafy vegetables under coastal saline soil condition of North *Konkan* region at Khar Land Research Station, Panvel, Dist. Raigad with the objectives of assess the performance of different leafy vegetables under coastal saline soils and the economics of different leafy vegetable cultivation

under coastal saline soil condition.

## Materials and Methods

The field experiment was conducted at Khar Land Research Station Panvel ($18^0$59'N latitude and $73^0$10'E longitude and an altitude of 5 meters above the sea level) during *rabi* season of 2017-18, 2018-19 and 2019-20. The soil of experimental plot was clayey loam in texture, having soil pH 6.80, electrical conductivity ranges from 2.45 – 3.20 $dSm^{-1}$ with low in organic carbon (0.58%), available nitrogen (262 kg $ha^{-1}$), available phosphorus (24 kg $ha^{-1}$) and very high in potash (1030 kg $ha^{-1}$). The experiment was laid out in randomized block with 5 leafy vegetables viz. *Spinach, Fenugreek, Coriander, Radish* and *Amaranthus.* All the leafy vegetables replicated four times. The *Pusa harit, Co-1, Sudha, NRD-48 and Konkan durangi* varieties were chosen for *Spinach, Fenugreek, Coriander, Radish* and *Amaranthus* respectively. The field is prepared with shallow ploughing the seeds of leafy vegetables were sown by drill method keeping 15 cm row distance. The recommended dose of fertilizer *i.e.* 80 kg N $ha^{-1}$ and 40 kg P $ha^{-1}$ were applied. The periodical soil salinity was recorded from sowing to harvest of the crops. The fresh green leaf weight was recorded by making bundles of 250gm. In case of *Spinach, Radish* and *Amaranthus* vegetables subsequent cutting were taken.

## Result and discussion

### Effect of salinity

The periodical soil salinity was recorded in units of electrical conductivity of a saturated soil paste extract (ECe) taken from the root zone of the plant and averaged over time and depth. Soil paste extracts are soil samples that are brought up to their water saturation points (USDA, 1954) [9] soil extraction method. The salinity in spinach and radish vegetables at harvested were 3.47 and 4.60 $dSm^{-1}$ which were beyond the threshold limit (2.0 $dSm^{-1}$) recorded 64.80 and 51.60 q $ha^{-1}$ leaf yield respectively during 2017-18, Similarly in 2018-19 and 2019-20 recorded salinity at harvest from spinach and Radish was 4.00, 4.10 and 4.11 and 3.95 $dSm^{-1}$ respectively which recorded 72.55, 58.43 and 72.46, 58.40 q $ha^{-1}$ yields respectively (Table 1). There were gradual increases in salinity from sowing to harvest of vegetables. Increasing salinity moderately reduced the yield of spinach compare to other vegetables. Shannon *et al.,* (2000) [8] also reported similar results.

### Leaf yield (q $ha^{-1}$)

The data pertaining in Table 2 showed that the leaf yields of various leafy vegetables were significantly influenced. The leaf yields of vegetables were recorded, it was resulted that *Spinach* recorded significantly higher yield followed by *Radish* in all the years. The yield of other vegetables was calculated on basis of *Spinach* equivalent yield. On basis of spinach equivalent yield, the *spinach* recorded significantly higher yield (64.80 q $ha^{-1}$) than *coriande*r and *Amaranth* and at par with *Fenugreek* and *Radish*. The *coriande*r recorded significantly lowest yield (33.66 q $ha^{-1}$) during 2017-18, while during 2018-19 and 2019-20 *spinach* recorded higher yield which were 72.55 and 72.46 q $ha^{-1}$ respectively than rest of vegetables except *Radish* crop which was at par with it. The significantly lowest yield (41.80 q $ha^{-1}$) was observed from *Fenugreek* crop (Table 2). From three years pooled data it was revealed that *Spinach* recorded significantly higher yield (69.94 q $ha^{-1}$) than rest of vegetables except *Radish* crop which was at par with it, the lowest yield was recorded from *coriander* (38.05 q $ha^{-1}$) (Table 3). In another study, spinach yield was increased at EC levels of 4 and 7 dS $m^{-1}$ and subsequently declined at EC 9.0 dS $m^{-1}$ and above (Ors and Suarez, 2017) [6]. In a recent study, Ferreira *et al.* (2020) [1] suggested the threshold level for spinach between 7 to 10 dS $m^{-1}$ for water salinity, and from 5.6 to 8.9 dS $m^{-1}$ for soil salinity.

### Economics

The highest net returns of Rs. 38,600/- was recorded under *Spinach* crop cultivation followed by *Radish* (Rs. 35,900/-). The lowest net returns of Rs. 17,500/- observed in *Coriander* vegetable crop under coastal saline condition. The maximum production and economic efficiency were noted in *Radish* crop which were 140.35 kg $ha^{-1}day^{-1}$ and 899.13 Rs./ha/day respectively.

**Table 1:** Salinity at harvest and leaf yield correlation

| Year | Particulars | Vegetables with salinity threshold limit (d $Sm^{-1}$) | | | | |
|---|---|---|---|---|---|---|
| | | Spinach (2.0) | Fenugreek (1.5) | Coriander (1.5) | Radish (2.0) | Amaranths (1.5) |
| 2017-18 | Salinity at harvest (d $Sm^{-1}$) | 3.47 | 3.38 | 3.25 | 4.60 | 4.27 |
| | Leaf yield (q $ha^{-1}$) | 64.80 | 44.17 | 25.25 | 51.60 | 39.61 |
| 2018-19 | Salinity at harvest (d $Sm^{-1}$) | 4.00 | 3.65 | 3.55 | 4.10 | 3.40 |
| | Leaf yield (q $ha^{-1}$) | 72.55 | 31.35 | 34.21 | 58.43 | 42.05 |
| 2019-20 | Salinity at harvest (d $Sm^{-1}$) | 4.11 | 3.90 | 3.50 | 3.95 | 3.55 |
| | Leaf yield (q $ha^{-1}$) | 72.46 | 41.80 | 34.89 | 58.40 | 42.05 |

**Table 2:** Yield of different vegetables grown under coastal saline soil condition.

| Vegetables | 2017-18 | | 2018-19 | | 2019-20 | | Pooled mean yield (q $ha^{-1}$) | Spinach equivalent yield (q $ha^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| | Leaf yield (q $ha^{-1}$) | Spinach equivalent yield (q $ha^{-1}$) | Leaf yield (q $ha^{-1}$) | Spinach equivalent yield (q $ha^{-1}$) | Leaf yield (q $ha^{-1}$) | Spinach equivalent yield (q $ha^{-1}$) | | |
| *Spinach* | 64.80 | 64.80 | 72.55 | **72.55** | 72.46 | 72.46 | 69.94 | 69.94 |
| *Fenugreek* | 44.17 | 58.89 | 31.35 | 41.80 | 31.35 | 41.80 | 35.62 | 47.49 |
| *Coriander* | 25.25 | 33.66 | 34.21 | 45.61 | 26.17 | 34.89 | 28.54 | 38.05 |
| *Radish* | 51.60 | 51.60 | 58.43 | 58.43 | 58.40 | 58.40 | 56.14 | 56.14 |
| *Amaranths* | 39.61 | 39.61 | 42.06 | 42.06 | 42.05 | 42.05 | 41.24 | 41.24 |
| S.E ± | | 4.96 | | 4.93 | | 4.88 | | 4.88 |
| CD @ 5 % | | 15.31 | | 15.20 | | 15.06 | | 15.05 |

**Table 3:** Economics of cultivation of different leafy vegetables

| Vegetables | Economic efficiency (Rs./ha/day) | Production efficiency (kg/ha/day) | Gross returns (x $10^3$ Rs./ha) | Cost of cultivation (x$10^3$Rs./ha) | Net returns (x$10^3$Rs./ha) | B: C ratio |
|---|---|---|---|---|---|---|
| Spinach | 552.40 | 99.91 | 104.9 | 66.2 | **38.6** | 1.58 |
| Fenugreek | 848.13 | 89.05 | 71.2 | 37.3 | 33.9 | 1.90 |
| Coriander | 437.85 | 71.35 | 57.08 | 39.5 | 17.5 | 1.44 |
| Radish | 899.13 | 140.35 | 84.2 | 48.2 | 35.9 | 1.75 |
| Amaranths | 804.45 | 103.1 | 61.8 | 33.6 | 28.1 | 1.83 |

Sale rate (Rs. $q^{-1}$):- for Spinach, Radish and Amaranths- Rs. 1500/- for Fenugreek & Coriander- Rs. 2000/-

**Fig (a):** Experimental plot view

## References


1. Ferreira JFS, Da Silva Filho JB, Liu X, Sandhu D. Spinach plants favor the absorption of K+ over Na+ regardless of salinity, and may benefit from Na+ when K+ is deficient in the soil. Plants. 2020;9(4):507-512.
2. Hanson B, Grattan A, Fulton A. Agricultural salinity and drainage. Davis, California: University of California; 2006. WMS (Water Management Series) 3375. p. 1-159.
3. Maas EV, Hoffman GJ. Crop salt tolerance - current assessment. ASCE J Irrig Drain Div. 1977;103:115-134.
4. Mondal MK, Tuong TP, Ritu SP, Choudhury MHK, Chasi AM, Majumder PK, *et al*. Coastal water resource use for higher productivity: participatory research for increasing cropping intensity in Bangladesh. In: Environment and livelihoods in tropical coastal zones: managing agriculture-fishery-aquaculture conflicts. Chapter 6. p. 72.
5. Natesh HN, Abbey L, Asiedu SK. An overview of nutritional and anti-nutritional factors in green leafy vegetables. Horticult Int J. 2017;1(2):58-65.
6. Ors S, Suarez DL. Spinach biomass yield and physiological response to interactive salinity and water stress. Agric Water Manag. 2017;190:31-41.
7. Patil KD, Vanave PB, Borse DK, Vartak VR, Palkar JJ, Khobragade SS. Coastal saline soils of Maharashtra. Research Bulletin. Khar Land Research Station; Panvel, Maharashtra; c2016. p. 15.
8. Shannon MC, Catherine MG, Scott ML, John HD. Analysis of salt tolerance in nine leafy vegetables irrigated with saline drainage water. J Am Soc Hortic Sci. 2000;125(5):658-664.
9. United States Department of Agriculture. Diagnosis and improvement of saline and alkali soils. Agriculture Handbook No. 60. Washington, DC: USDA; c1954. p. 160.