

INTRODUCTION

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Oil seeds are one of the oldest products of this earth and they play an important role in human life, being next to food grains in satisfying the varied needs of man. They also have an important bearing on the standard of living of the community at large, because besides the use of oils as edible products, they are required for the preparation and manufacture of soaps and toiletries, hair oils, paints, varnishes etc. Oils in the form of lubricants keep the wheels of machinery in motion. Long before kerosene, gas and electricity were devised, vegetable oils were being used since ages as illuminants to brighten up the house of man. Oil seeds can therefore be said to be a multiproduct & multipurpose commodity and their contribution to our national economy should be viewed in their proper perspective.

Nature has endowed our country with the growth and production of a variety of oil seeds and India holds a prominent position amongst the oil seeds producing countries of the world. India is perhaps the only country, which produces in commercial quantities greater varieties of oil seeds than any other country of the world, with the exception of soybeans, palm, and olives. India makes an important contribution to all the principal kinds of oilseeds to ensure an important place in the international trade in vegetable oils.

The yields of the important oil crop like peanuts (Arachis hypogea) are generally deteriorating in recent years. To cope up the demands it is essential to supplement the additional oil resources. With a view to promote the production of oil seeds in the country, farmers are being motivated to cultivate safflower (Carthamus tinctorius L.) as an additional oil yielding crop in areas where the rainfall is either unassured or comparatively low.

Rabi oil seeds constitute three important crops viz, rapeseed, mustard and safflower as edible oil seeds and linseeds as a non-edible oil seeds. Of these three rabi crops, rapeseed-mustard occupied first position in India followed by safflower. However, in Maharashtra safflower (Carthamus tinctorius L.) is most important rabi seed crop.

In past safflower was grown for a source of dye for clothing and food. The leaves of young plants are also being used as vegetable. In recent years safflower is now grown mainly for edible oils. The oil is edible and utilised in different forms. It has good cooking quality and several industrial applications. Oil yielded from safflower is without doubt, safest and the best for heart patients having high cholesterol levels in blood.

In Indian this crop occupies 590,000 hectore with production of nearly 130,000 tonnes. Over 98% of area is concentrated

in state of Maharashtra (64.4%), Karnataka (26%) and Andhra Pradesh (80%). Safflower crop is grown during rabi season as a rainfed crop (PLATE-I), but in some area it is raised under irrigation.

Now it is universally accepted that understanding physiology of crop species should be an essential pre-require for any ambitious breeding programme. This has been very well achieved in crop like sugarcane, rice wheat, groundnut, soybean, However, there are only a few attempts in this direction so far in case of minor crops like safflower. Therefore we thought it worth while to undertake the present investigation.

Very little research work particularly on physiology of safflower is done. Hence an attempt is made in present investigation to study the physiology of safflower with special reference to mineral nutrition under salinity and drought condition for this study Bhima variety has been selected.

Soil salinity is the threatening problem to the modern agriculture, which causes great losses by lowering the yields of various crops in many parts of the world. About 25% of earth's surface can be considered as 'Saline'. Millions of hactores of cultivated land in our country has become saline due to mismanagement in fertilization and irrigation. In India, the states where this problem is very serious are Uttar Pradesh, Haryana, Gujrath and Rajasthan, estimating about 12 million

Table (1)

Grouping of the estimated salt affected area's in
India on tentative basis.

(After Sharma and Gupta, 1986)

Area	State	Million hactore
Indo-Gangetic alluvial plains	U.P. Haryana, Delhi, Punjab Bihar, and Part of Rajasthan.	4.0
Medium and deep black soil	M.P. Rajasthan, Gujrat, Maharashtra, Karnataka and A.P.	4.0
Arid and Semi-arid tracts	Rajasthan and Gujrat	1.0
Coastal alluvial	Gujrat, West Bengal, Orissa, Kerala, Tamil Nadue, A.P. Maharashtra	3.0

hectares of land (Sharma and Gupta, 1986). (Table 1). In Maharashtra also several hundreds of hectares of land under sugarcane cultivation is becoming saline. To overcome salinity problem, two main approaches have been suggested, one, an engineering approach and the other, biological approach. The biological approach seems to be practicable in countries like India. This approach deals with the screening of crop species or cultivars for salt tolerance and their utilization, further, in breeding programmes for the salt tolerant varieties. Therefore it is essential to screen the several crop species for their mechanism(s) of salt tolerance and it is important to understand the physiology of crop plant when grown under saline conditions.

Crop production in modern agriculture is always threatened by extreme environmental conditions such as high temperature, freezing temperature, drought and salinity, are extremely connected with water. Water play a key role in plant life, it comprises approximately 85 to 90% of total fresh wt. in physiologically active herbaceous plant (Kramer, 1980). When water is not available for plants to absorb, the condition developed is called physical drought, water stress or moisture stress. This problem is more realized in tropics for prolonged drought. Thus plants are exposed to 'drought' which in recent years more precisely called as 'water stress' (Jones et.al., 1981). Water stress is known to have multifaceted effect on plant metabolism



(Hsiao, 1973). Water deficit directly or indirectly affect almost all life processes of plants such as photosynthesis, mineral nutrition, transpiration etc. It is therefore necessary to screen drought resistant characters or adaptations. Screening for such characters should more realistically be carried out in rainfed crop such as groundnut, sunflower, and safflower.

To understand the basic problems and facts involved in the study of safflower a brief resume of current status of literature is given in Chapter - 1 of the present investigation. An attempt has been made to take a brief review of morphology, agronomy, economic importance, and physiological work on this crop. Chapter - 2 deals with the material obtained and methodology adapted for culture and plant analysis.

To know the basic problem of salinity and for better understanding of germination process a brief review has been given in first part of Chapter - 3. The important findings of germination studies under NaCl salinity has been critically discussed and co-related in the light of recent literature is also given in second part of this chapter. In this chapter the effect of NaCl salinity on germination percentage, height of shoot and root length, moisture percentage and change in organic constituents like TAN, carbohydrates, total nitrogen and crude protein, polyphenols and total lipids as well as some inorganic constituents have also been studied.

In Chapter - 4 of this thesis an attempt has been made to study the effect of NaCl salinity on growth parameters, organic and inorganic constituents has been described in this Chapter.

In present investigation an attempt has been made to study the effect of water stress on growth parameters, organic constituents and some inorganic constituents has been studied and their results are discussed in Chapter - 5.

Finally the significant findings of this investigation *have* has been summarised briefly in the Chapter - 6.

The last part of the thesis includes the references (research papers, books, reviews and monographs) used for discussion which have been listed alphabetically and chronologically in "BIBLIOGRAPHY".

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