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Moisture dynamics and water use efficiency as influenced by different methods and levels of irrigation for vegetable crop under salt-affected soils

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■ **ABSTRACT :** The study was conducted at the Agricultural Research Station, Gangavati, University of Agricultural Sciences, Gangavathi in northern Karnataka, India during *Rabi/*summer, 2007-08 and 2008-09 with beetroot (*Beta vulgaris)* as the test crop. Under the drip irrigation, the soil moisture content was the highest and maintained almost steadily near the field capacity throughout the cropping period at all distances away from the dripper. The maximum moisture content near the dripper was reduced to the extent of 15 and 19 per cent at a distance of 60 cm away horizontally and vertically downwards, respectively, from the dripper during 2007-08 in case of drip irrigation at 0.6 ET in salinity level-I, against16 and 20 per cent during 2008-09. The soil moisture content at particular distance from the point of application increased with increase in depth of applied water and it decreased with distance from the point of application (R^2= 0.83 to 0.92). The maximum water use efficiency of 6.74 and 6.23 kg m^{-3} was achieved in drip irrigation at 0.6 ET under salinity level-I and the lowest water use efficiency of 2.78 and 2.40 kg m^{-3} was recorded in drip irrigation at 1.4 ETin salinity level-III during 2007-08 and 2008-09, respectively. Among the surface irrigation levels, the highest water use efficiency of 4.25 kg m^{-3} at 1.0 ET and 3.32 kg m^{-3} in 0.8 ET was recorded in salinity level-I during 2007-08 and 2008-09, respectively.

■ **KEY WORDS :** Drip, Surface irrigation, Irrigation, Vegetable, Beetroot, Soil salinity, Moisture distribution, Water use efficiency

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Waterlogging and salinity are global phenomena that affect the agricultural economy considerably. The salt-affected soils are distributed in more than hundred countries especially in arid and semi-arid regions to the extent of about 95.5 M ha and it was estimated that the world as a whole is losing at least 3 ha of fertile land every minute due to salinisation/sodification (Siyal *et al*., 2002). Though India has made phenomenal irrigation development during the post-independence period, the performance of most of the major and medium irrigation projects is highly disappointing due to various factors. Particularly the twin menacing problems of waterlogging and salinity have become a major concern as they pose serious questions on capital investment and cause environmental problems. The salt-affected soils form sizable area in India and according to one estimate an area of 6.73 M ha has been salt-affected in the country (Sharma *et al.,* 2006). As per the future projection, an area of about 13 M ha is likely to be affected by these problems in the irrigation commands of India. This does not take into account the area under non-commands, coastal salinity and salinity in groundwater irrigated land with deep water table. Waterlogging, soil salinity and saline groundwater conditions at shallow depth in Haryana resulted in a potential annual loss of about US $ 37 M at 1998-'99 prices (Ambast *et al.*, 2007). About 42 per cent increase in area under waterlogging and soil salinity in southwest Punjab occurred over a 4-year period during 1997-2001. The state of Karnataka is no exception and considerable extent of command areas of various irrigation projects has been afflicted by the problems of waterlogging and salinity. According to guesstimates, 3.5 lakh ha area has been affected in the state; of which about 80,000 ha is in the Tungabhadra Irrigation Project (TBP) area accounting for nearly 22 per cent of the command area. The problems being dynamic in nature are developing at rapid pace. Unless, these problems are addressed and solutions are evolved for prevention of the same and reclamation/ management of the already affected areas, the performance of the projects and agriculture productivity and production