

Abstract

Water is the main limiting factor in expanding spring sown sugar beet production in Iran. Compared to spring sown sugar beet, autumn sown sugar beet is of much higher economical viability and water use efficiency, and therefore, its expansion is one of the priorities of the Ministry of Jihad-e-Agriculture. Khorasan Razavi and Khorasan Jonobi Provinces are among the most important regions in sugar beet production in Iran with only spring sown crop cultivation. Therefore, it is necessary to study the feasibility of autumn sown sugar beet production in these regions. The best and least expensive method for identifying suitable areas for autumn sown sugar beet is to use geographical information systems. Therefore, first a climate database was constructed. Planting and harvesting dates were then zoned based on results obtained from conducted research projects and on the probability of threshold temperatures occurring at various crop development stages. Based on the obtained threshold temperatures and growing degree-days, Matlab R2013b was used to write the necessary equations for calculating and extracting the required factors. Hourly temperature and day length data were collected for each station and for various years to calculate vernalization threshold. After calculating all the factors at each studied station for each year, the Easy Fit 5 software was employed to determine the occurrence probability of the factors. Regression models, inverse distance weighting and kriging were taken into account to select the best interpolation method; Minitab 17 was used to extract gradient functions; ArcGIS 10.2 was then employed to analyze data and zone for each layer, and the Expert Choice software was used for weighting information layers. Altitude, slope, rainfall, and vernalization had the maximum weights among the main factors, while biomass index and day length had the minimum weights. After analyzing and overlapping the layers, the final map was prepared using the hierarchical method. Based on cultivation capability of the various studied provinces, they were divided into four classes of very suitable, suitable, moderately suitable, and unsuitable for sugar beet cultivation. Three research projects of comparing cultivars in cold, warm, and temperate regions were conducted to complete the information required for the data bank of the projects and to evaluate the zoning accuracy. The regions with field data were then clustered using SPSS. Planting and harvesting dates were determined by considering the occurrence probability of threshold temperatures during various crop development stages. The suitable planting date for southern part of the Khorasan Razavi Province, in Bardaskan, and in the western part of Sabzevar in this province was determined to be from 27 September to 7 October. This planting date was also recommended for the southern, eastern, and western parts of the Khorasan Jonobi Province; and suitable harvesting date for the southern parts of these provinces was from 5 May to 5 June. Because of their temperature limitations, these regions have shorter growing seasons compared to the central areas; nevertheless, they enjoy a larger number of days that are suitable for crop growth, and a greater number of GDDs, compared to the central areas. Zoning results showed sugar beet vernalization took place in many of the studied regions, while most regions in the southwestern part of the Khorasan Jonobi Province did not receive the total GDDs for vernalization and sugar beet plants were not vernalized. Rainfall of less than 50 mm during the growing season in the southern regions of the Khorasan Jonobi Province reduces the advantages of autumn sown



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Title

**Agro climatic zonation and feasibility study of autumn-sown sugar beet in
Khorasan Razavi and Khorasan Jonobi Provinces**

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