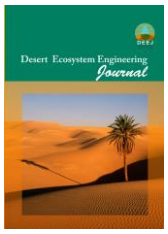
DEEJ (2019) 8 (23) 59-72

University of Kashan

Desert Ecosystem Engineering Journal

Journal homepage: http://deej.kashanu.ac.ir



Dust Storms Detection and Its Impacts on the Growth and Reproductive Traits of Grape vine (*Vitis vinifera*) in Malayer Plain

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Received: 17/01/2019 Accepted: 12/05/2019

Extended Abstract

Introduction: Dust storm is one of the air pollutants in desert areas that have damaging effects on environmental ecosystems. This phenomenon usually happens when severe winds occur in arid areas which are accompanied by the ascent of dust particles to the upper layers of the atmosphere. HYSPLIT model can assist in detecting the path of dust entering the stations. In addition, synoptic patterns play an important role in the occurrence of dust storms; as the atmospheric low-pressure system with a pressure gradient causes dust storms in desert areas. Dust can cause physiological and morphological effects on the plant. The deposition of particles on the leaf surface reduces light and shades on the leaf, which reduces photosynthesis and chlorophyll and stomata conduction in the leaf which has a negative effect on plant growth. The purpose of this study was detection the origin of dust storms at Malayer Plain with the tracing and extraction of generation of synoptic patterns and its effects on vegetative and reproductive traits of grape varieties of white seedless variety.

Materials and Methods: At first, the dust codes were extracted in a 24-year period (1992 to 2015) and were monthly and annually analyzed. Then the sand rose was plotted by wind rose plot software. In order to identify the synoptic patterns of dust storms in Malayer plain the PCA (Principal Component Analysis) method was used. The HYSPLIT model was used to detect atmospheric dust. In the second part of this study, the effects of dust storms on Malayer plain vineyards were studied during 2015 and 2016 years. The treatments were 1) washing and 2) non-washing grapevine after event of dust storm. Then, chlorophylls *a* and *b*, relative water content, leaf fresh and dry weights, length of shoot and internode were measured. Moreover, reproductive traits such as fruit set, number of berries per cluster, weight of cluster, sugar berry and yield were measured.

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DOI: 10.22052/deej.2018.7.23.45

Result: A total of 459 dusty days were observed during the study period with an annual mean of 19. The statistical analysis indicated a considerable increase in dust storm frequencies in the study area. The total number of dusty days in June accounts for 18.4% of each year, followed by April (15.8%), and May (12.4%). According to sand rose study of Malayer plain, prevailing dust storm blew from West (16% all dust storm) and South (15%) during the year. In the dominant patterns over 500 hPa and sea level pressure, the *NCEP*/NCAR ***reanalysis*** data show that an upper trough over the eastern Mediterranean is reflected in lower surface and accompany with a low-pressure center over Saudi Arabia which associated with the high pressure in Siberia and extending towards the south-east during warm times. This condition led to occurrence of dust storm in Malyer plain. There are two main paths to transfer the dust to the study area: (a) NW-SE which dust particles are transported from the northwestern region of Iraq and eastern Syria (60%) and (b) S-N where the dust particles are transported from central regions of Iraq and an internal source in southwestern of Iran, Khuzestan province (30%) to the Malayer station. Dust particles by deposition on the leaf of the grapevine reduced the chlorophyll a and b, fruit set, cluster weight and grape yield compared to plants washed with water; but dust particles did not impact on length of shoot, relative water content, leaf fresh and dry weight of grapevine.

Discussion and conclusion: The increasing trend of temperature and drought led to disruption of soil and vegetation cover. Additionally, desertification and drought resulted from mistreatment of water resources and climate change contributes to increasing of dust storm sources in the Iraq and West of Iran. The main cause of dust storm events in the spring is the formation of a low-pressure system in the lower atmosphere of the west of Iran with a divergence in upper level of atmosphere (500 hPa) over the deserts of Syria, Iraq and western Iran. Al-Hawizeh/Al-Azim marshes are covered by fine sand which is regarded as the extension of the dust storm source areas in Iraq border. In West Asia, most of dust storm events can be classified into Summer Shomal and Frontal dust storms. Shomal dust storm occurs across Iraq, Kuwait, western part of Khuzestan plain and some parts of Arabian Peninsula. Results of present study showed that main dust storm sources of western parts of Iran are central to northern parts of Iraq, and Eastern and central parts of Iraq and Syria, western parts of Baghdad and dry Al-Howizeh/ Al-Azim marshes. The results revealed that Chlorophylls measures are an important tool to evaluate the effect of air pollutants on plants. Chlorophyll plays an important role in plant metabolism and the reductions in chlorophyll concentration correspond directly to the reduction in plant growth. This study showed that the reduction of grape yield was 13 percent in dusty treatment as compared to control one. It can be concluded that increase of dust load resulted in lower stigma pollen loads. Moreover, dust can form a blockage layer on the stigma which could prevent the germination of pollen grains on the stigma and consequently reduction of fruit set.

Keywords: PCA, Fruit set, Photosynthetic Pigments, Sand Rose, HYSPLIT Model.