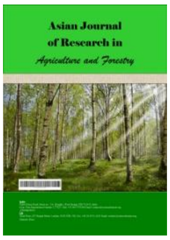


Asian Journal of Research in Agriculture and Forestry

7(4): 12-24, 2021; Article no.AJRAF.73001
ISSN: 2581-7418

Effect of Environmental Factors on Apricot (*Prunus armeniaca* L.) Yield in the City of Jerusalem Occupied, Palestine

Jehad M. H. Ighbareyeh[1*]

[1]Department of Plant Production and Protection, Faculty of Agriculture, Al-Quds Open University, Hebron Branch, Abu ktellah street, Hebron, Palestine.

Authors' contributions

The sole author designed, analyzed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/AJRAF/2021/v7i430134
Editor(s):
(1) Dr. Christine Wulandari, University of Lampung, Indonesia.
Reviewers:
(1) Abd El- Rhman Ibrahim El –Sayed Ramdan, Desert Research Centre, Egypt.
(2) Abdirazak Abdala, Southern Agricultural Research Institute and Worabe Agricultural Research Center, Ethiopia.
Complete Peer review History: https://www.sdiarticle4.com/review-history/73001

Original Research Article

Received 29 June 2021
Accepted 09 September 2021
Published 13 September 2021

ABSTRACT

Apricot is a deciduous perennial tree, which classified within to the Rosacea family, sensitive to climatic factors, and its production has an economic role for many countries of the world, including Palestine. Mean annual temperatures and precipitation were analyzed, using data from a meteorological station of Jerusalem, Palestine, which has recorded between the year (1993-2012), and with the same number of years of apricot production, knowing that production data were taken from the Palestinian Statistics Center for the mentioned period. On the other hand, we used Professor Salvador Ravers Martins' methodology to classify the Earth in the process of analyzing environmental factors, there are two aspects of the factors: The first is climatic, which is the amount of rain or precipitation, mean monthly temperature and soil water reserve, and the second factor is the bioclimatic, which is annual ombrothermic index, simple continentality index, compensated thermicity index, and water deficit. In conclusion, Jerusalem was adversely affected by mean monthly temperature, precipitation, compensated thermicity index, deficit water, annual ombrothermic index during (1997-2002 and 2007-2012), but positively influenced by soil water reserve on apricot production, during (1993-1997 and 2002-2007), with a great rate of the variance in axis F1 (98.8%), axis F2 (0.82%) and symmetrical plot axes F1and F2 (99.8%), when the correspondence analysis was applied. However, humid areas characterized by mild summers are

**Corresponding author: E-mail: jehadighbareyeh@hotmail.com;*

the suitable region for apricot production and productivity, with a temperature ranging between 22-24°C, at which high quality production can be obtained, the amount of rain is between 600 - 800 mm annually. Final, environmental regions in the thermomediterranean and the Mesomediterranean, with simple continentality index is 17 - 22, annual ombrothermic index is 2.5, while the compensated thermicity index is about 250/420, to obtain the highest ideal production of apricots in Jerusalem, Palestine.

Keywords: Palestine; jerusalem; apricot, bioclimatology; mediterranean; indexes climate change and production.

1. INTRODUCTION

Apricot trees are affected by weather conditions, during the flowering and fruiting period, and high temperature is a play negative kay in the post-decade and fruit growth on the production, quantity and quality of fruits. Also, the increase in air humidity during this period helps to increase the spread of fungal diseases, especially whiteness diseases, which cause deterioration on the commercial properties of the fruits. Moreover, the lack of low temperatures and cold during the fall and winter seasons causes the ending of the interval of inactivity and consequently the delay in the opening of the flowering and green shoots and not waiting for them to open.

However, apricot yields are highly dependent on climatic conditions [1-4], the most important climatic factors affecting yield deviations were related to temperature in flowering, growing and harvest time [5,4]. The study conducted by Gunduz et al. [2], the results showed that the total amount of precipitation during the flowering period positively affected the apricot yield, while the moisture, minimum temperature and maximum temperature variables negatively affected the apricot yield during flowering and cultivation period. Moreover, the origin of apricots is not officially known or contested among scholars and researchers in this field, it is believed that the origin of apricots in Armenia, archaeological excavations in Garni in Armenia have found apricot seeds at a site from the Stone Age [6], and in China [7], while other sources have spoken, apricots were first cultivated in India around 3000 BC [8], whereas, a genetic study concluded during the last year, apricot was domesticated individual three times, once in China, twice in Asia, and with prolonged pollination between the deferments species throughout the Europe and Asia region [9]. Apricot production contributes to increasing the national economy of many countries of the world, such as Turkey, Uzbekistan, Iran, China, Italy, Algeria, the United States of America and Palestine.

The global production of apricots reached 4.3 million tons, and Turkey ranked first in the world with 23% of the total global production, in addition to many other producing countries, namely Uzbekistan, Italy, Algeria, Iran and others [10]. Also published or reported by the Palestinian Central Bureau of Statistics, the area of the irrigated or rainfed apricot 98 dunum, and the productivity is 22 tons, 220 kg per dunum in Jerusalem, and 1304 tons in Palestine territories at year (2007-2008) (PCBS, 2009), notwithstanding, the amount of production and the area is not specified, it changes from time to another. Furthermore, in Palestine, apricot trees were planted in the mountainous and interior regions, and the most important varieties are Al-Baladi (Al- Kalabi), Manchurian, Al- Hamawi (Al-Miskawi) and others.

The climate of the Holy City (Jerusalem) is hot and dry in summer, and rainy, mild in winter, which represents a model for the Mediterranean climate [11,4,12] addition to several studies that were conducted on biology, [13] biodiversity [14-20], impact of climatic factors and Agro-Ecosystem in Palestine [21-23,4] and the Mediterranean Sea [24,11,25-26,3,27-35,15,36-37,12,38-40] .

This study aims to investigate the effect of environmental factors on yield apricot in the Holy City (Al-Quds Al-Sharif) of Palestine occupied.

2. METHODOLOGY

2.1 Study Area

Jerusalem is a Canaanite city built and founded by the early Jebusites, who inhabited it in the fourth millennium BC, the Copper Age. The holy city is characterized by an important geographical location, because of its location on the Jerusalem plateau and above the mountain peaks that represent the central chain of the Palestinian lands. It is also located on the green line (i.e. the dividing line), separating the West Bank borders of 1967 and the borders the Zionist entity, in a large valley between the mountains that surround it. It is 54 km east of the Mediterranean, 23 km west of the northern end of the Dead Sea, and 250 km north of the Red Sea. The area of the city of Jerusalem is about 652,000 dunum, rises 754 meters above sea level, and it has coordinates 31°47′ north, 35°13′ east, noting that the Jerusalem meteorological station is located at 35º13′ east, 31º52′ north, with a 750 m., through which meteorological data were obtained in this research.

2.2 Data Analysis and Statistics

In this presented research, we chose plant production data from the Palestinian Central Bureau of Statistics, while meteorological data from the meteorological station for occupied Jerusalem (http://www pcbs.gov.ps/) during the specified period between (1993 to 2012), as tabulated in the (Table 1) and (Figs. 1 and 2). Also the study area included only East Jerusalem, that is, the area was occupied in the year one thousand nine hundred and sixty-seven by Israel.

The process of analysis included two important factors, namely the temperatures and the amount of rainfall, on the basis of which the bioclimatic and climatic factors were analyzed. As for climatic factors, it consisted of temperature or mean/average monthly temperature (T), precipitation (P) and soil water reserve (R), while bioclimatic factors consist of an annual ombrothermic index (Io) and a simple continentality index (Ic), compensated thermicity index (It/Itc) and water deficit (Df). Bioclimatic and climatic factors are called independent variables, while the amount of apricots yield, is a dependent variable in the process of analysis, with reference to the fact that Salvador Rivas Martinez's methodology for classifying the land was adopted to analyze bio-climatic factor [41-45], In addition, Jarque Bera [46-47] & Shapiro Wilk [48-49] test was applied, and the probability for seven variables was determined, bearing while taking into account that these statistical analyzes were achieved employ the XLSTAT software.

Moreover, we applied ANOVA [50] to the eight variables, the independent variables (three climate factors) and (four bioclimatic factors), and (apricot production, which is dependent variable), to perform Principal Component Analysis (PCA) to reveal the effect of independent variables on apricot production.

3. RESULTS AND DISCUSSION

3.1 Analysis of Climate and Bioclimatic Factors and their Effect on Apricot Production

3.1.1 Principal component analysis

In this study, and after we performed the analysis process using the aforementioned Salvador Rivers Martinez methodology to analyze environmental factors, in addition to the natural tests of Jark- Pera & Shapiro - Wilk, with used of the XLASTAT program, the resulting probability value obtained from the environmental variables was to less than 0.05, which is significant acceptable, and it has been done principal component analysis which is used to load factor analysis, exploratory analysis data, eigenvalues, and eigenvectors.

3.1.1.1 Eigenvectors, eigenvalue and factors loading analyses

Scientists Herstein [51] and Nering Evar [52] have emphasized that eigenvalues and eigenvectors use either matrix methods or linear transformations, so in linear algebra, the vector of a linear transformation is a vector that is not equal to zero and changes only by a scalar factor during the application of this linear transformation.

Where vector is eigenvector of Matrix, if M = λv, and the eigenvalue with respect to vector is called.

The eigenvectors of length 1 can be continually determined by the following related:

$$\sqrt{{v_1}^2 + ... + {v_n}^2} = 1 \quad (1)$$

Principal component analysis was used to support recognize the different variants, and the use of factor ancestry for an eigenvalue more than one after the varimax sequence. Principal component analysis outcome contained loading factors with varimax relay and eigenvalues, which are estimated in the (Table 2) and (Fig. 3).

Fig. 1. The site of Al-Quds Al-Sharif in Palestine by satellite

Fig. 2. The meteorological station for the city of Jerusalem, and some of the Palestinian weather stations

Table 1. Apricot production data and independent variables (Climate and bio-climate factors) to Jerusalem city between the year 1993 to 2012

Years	TM	P	Df	R	It/Itc	Ic	Io	Apricot production
1993-1997	18.9	549	576	413	422	17.4	2.3	320
1997-2002	19.9	511	618	444	475	16.1	1.9	310
2002-2007	18.1	577	566	398	390	18.9	2.5	340
2007-2012	19.3	533	586	408	433	18.6	2.3	330

*Yield **(**Kilogram per dunum).*

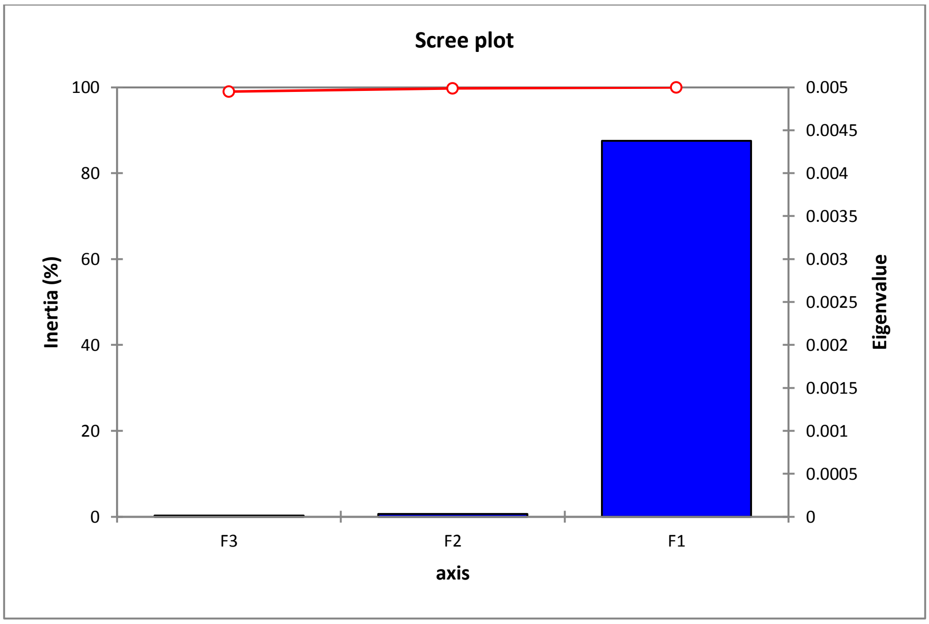


Fig. 3. Principal component analysis of eigenvalue factor

Regardless, the eigenvalues were less than one, the overall variable factors was (98.875%), the first factor dominated by environmental factors (climate & bioclimate), such as the simple continental index (0.725), annual ombrothermic index (1.317), precipitation (0.617), by calculating (98.875%) of the total variance, while, temperature and the rest of the other factors, it was negative, such as the average monthly temperature (-0.56), soil water reserve (-0.623), water deficit (-0.53), and compensated temperature index (-1.111). In the second factor or factor 2 is positively dominated by soil water reserve factor (1.514), while it was negatively for the remaining factors, it represents (0.830%) of the overall variance, whereas, the last factor is dominated by annual ombrothermic index (1.63), water deficit (1.061), whilst it is negatively for the remaining factors and appear (0.297%) of the total variable in Table 2.

3.1.1.2 Correspondence analysis

The productivity of the apricot plant in Jerusalem is negatively affected by bioclimatic factors: Simple continentality index , annual ombrothermic index, water deficit and compensated thermicity index, compared with other climatic factors as precipitation & average monthly temperature, with high contrast at the F1 axis (98.88%), the F2 axis (0.82%), and the symmetric row F1 and F2 axis outline (99.8%), through the years (1997 to 2002 & 2007 to 2012), when a correspondence analysis were applied as cleared in (Fig. 4), therefore, all these factors fall below zero for the x-y-axis, as shown in (Fig. 4), but positively affected by the factor soil water reserve at the years (1993-1997 and 2002-2007) may be related to the soil type and its suitable to the apricot growth and production, additionally, this factor has a value of more than one and is located on the far right of the x-axis (Fig. 4).

Apricot production is greatly influenced by climatic factors as temperatures & rainfall and bioclimatic factors as simple continentality index, compensated thermicity index, so the amount of water fallen in the Jerusalem area, which does not exceed 600 millimeters per year, and the varying monthly temperature is not sufficient to increase production, addition to many among other factors, such as diseases, insects, and soil type, knowing the results confirmed that the soil type is very suitable for growing apricots and increasing its productivity during the analysis process in this research. Otherwise, for high quality of production and growth of apricot trees this plant can acclimatize in dry to humid areas described in moderate summer with a temperature of 18-24 ° C, and precipitation is more than 600 mm per year, and including thermomediterranean to mesomediterranean environments regions.

However, in the ANOVA analysis of variance, a 95% confidence interval was applied to the yield of the apricot plant, with the influence of different environmental factor variables (Io, T, It/Itc, P, Df and Ic), to explain the large differences in apricot yield. The consequences of the standard coefficient or parameter the analysis showed that there was a significant difference on apricot productivity, as it showed the best standard variable with the value of rainfall, simple continentality index and ombrothermic index (0.995, 0.790 and 0.901) respectively, cause the histogram is closed at 1 (Figs 5 b, e, and f), while the standard coefficient is negatively connected to several factors, including average monthly temperature, compensated thermicity index and water deficit (-0.997, -0.979 and -0.918), respectively, cause the histogram is negative (Figs 5 a, c and d).

Table 2. Represented eigenvalue factors of the principal component analysis

Environmental Variables	F1	F2	F3
T	-0.56	-1.902	-1.225
P	0.617	-0.465	-1.51
Df	-0.53	-0.357	1.061
R	-0.623	1.514	-0.346
It/Itc	-1.111	-0.399	-0.071
Ic	0.725	-7.158	1.63
Io	1.317	-7.123	-2.058
Apricot production	1.856	0.478	0.962
Eigenvalue	0.003	0	0
Inertia (%)	98.875	0. 830	0.297
Variance %	98.875	99.81	100

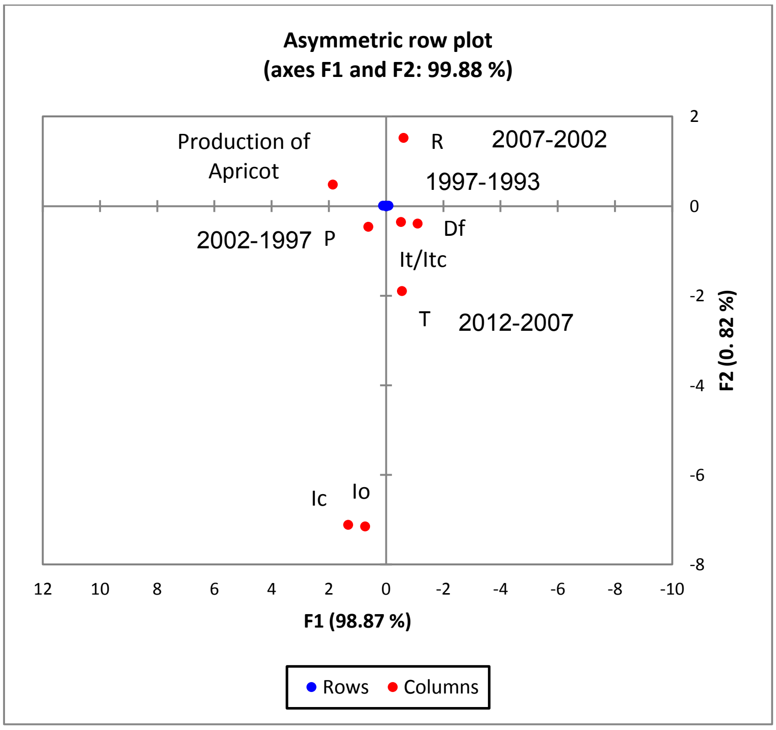
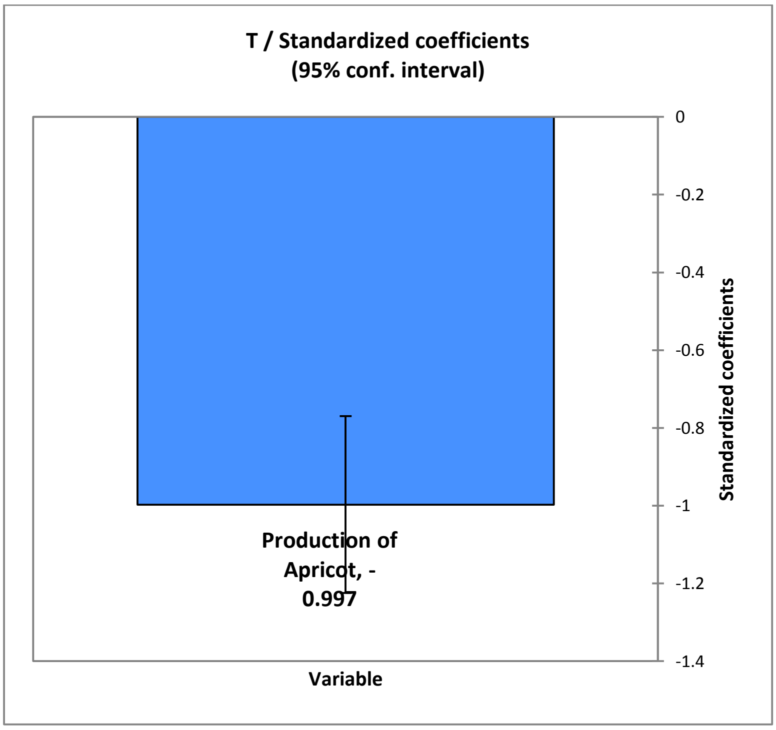
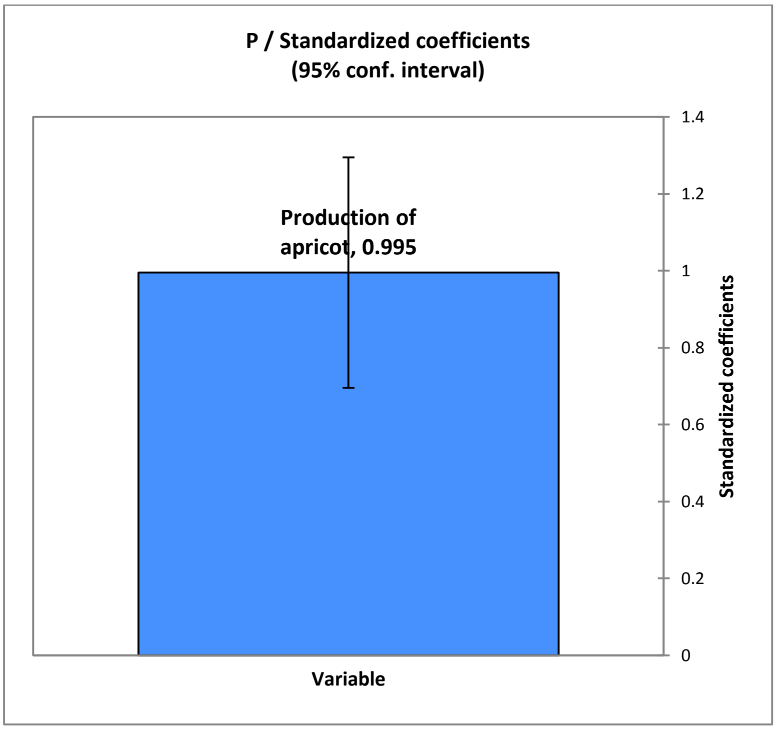


Fig. 4. Correspondence analysis for various variables such as climate and bioclimatic factors

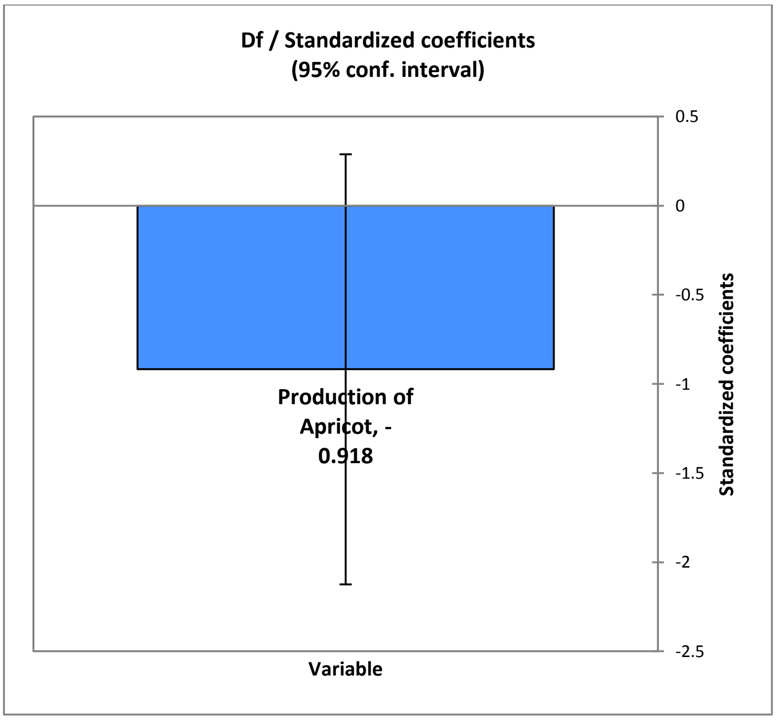
In the other side, Rosary soil, which constitutes about 60% of Palestine's soils, is suitable for the cultivation of apricots, and the deep muddy and yellow clay soils are devoid of the salts, the ground water level is low, not less than 1.5 meters, it is also considered from the best types of lands for apricot cultivation in different countries in the world, in addition, it is preferable to cultivate apricots in moderate acidic soil with a pH value (pH = 6) as this plant tolerates high alkaline soils. The apricot plant is affected by the weather conditions during blooming period & fruit set, as the high temperatures in the post-decade period and the growth of fruits have a negative effect on the yield and on the properties of the fruits. Addition to, numerous studies have shown that as a result of short or warm winter seasons, an incomplete resumption of flower bud dormancy occurs, resulting in minimal apricot blooming [53,54].



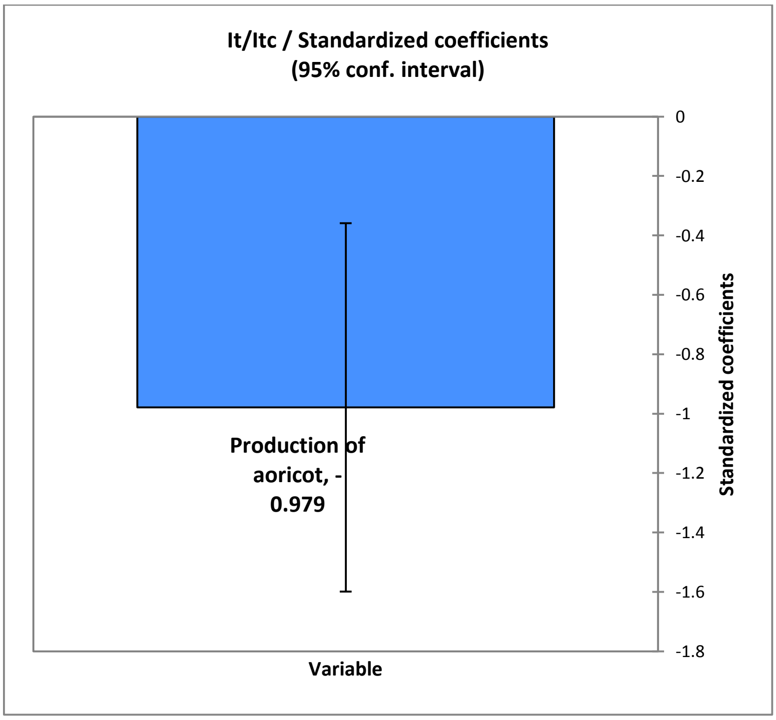
Graphic A



Graphic B

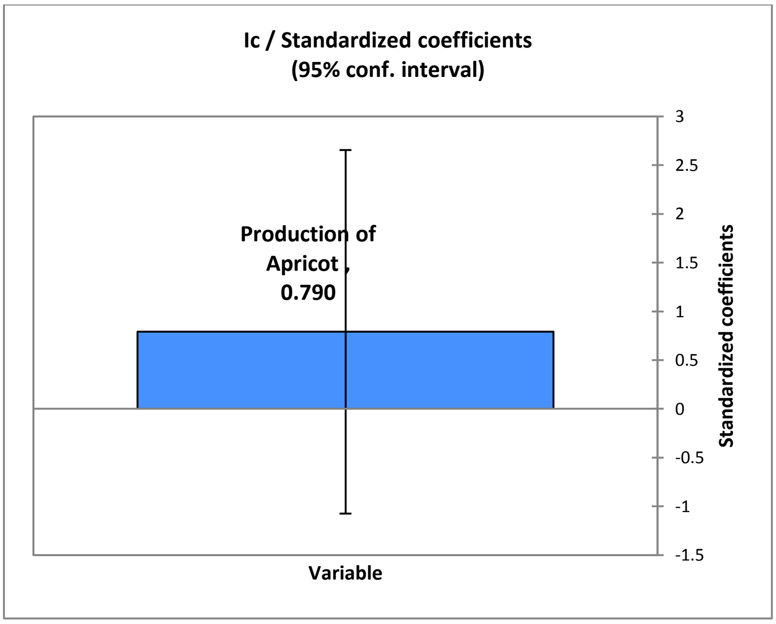


Graphic C

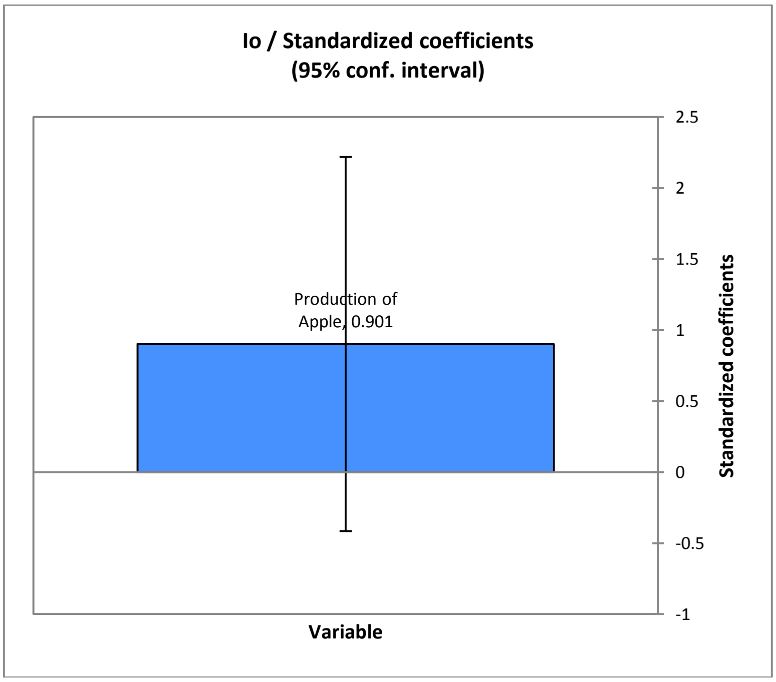


Graphic D

Apricot bears cold winters to very low temperatures (-25°C) for a period of 3-4 days, but it is sensitive to spring frosts, due to the early flowering buds opening, exposing them to death and damage during the first spring frost, and by Vital et al. [55], shown that among the varieties of apricots, significant differences were reported in the cooling requirements or chilling unit, whereas the demanded of apricot varieties for the winter cold are very different, but the apricot tree has a short dormancy period, and requires about (400 – 600) horas cooling and about 1500 - 2000 hours heat, and there are foreign varieties that need (600-1000) chilling unit, disparity, according to the pattern propose by Richardson et al. [56], Ruiz [57] and Viti [58] have shown that most apricot trees require average refrigeration requirements in Mediterranean regions ranging from (800-1200) chilling units (CUs). Furthermore, the optimum temperature for storing and preserving apricots is -0.5 to 0°C, while ripening is from 18-24°C, with a relative humidity of 90 to 95% [59,60,61].



Graphic E



Graphic F

Fig. 5. Graphics of environmental variables and standardized coefficients (a-f)

In any case, most research studies indicate the negative effect of precipitation, temperature on production, growth and sustainability of apricots, especially if there is a variation in temperature and a decrease in the amount of rainfall per year, and this is evident in this research.

4. CONCLUSION

Jerusalem region was negatively affected by compensated thermicity index, water deficiency, average monthly temperature, annual ombrothermic index, and precipitation, but it was positively affected by soil water reserves for apricot production, and the optimum temperature for apricot production ranges between 22-24 °C, precipitation is between 600 - 800 mm per year, simple continentality index is 17-22, annual ombrothermic index higher than 2.5, and compensated thermicity index is about 250/420, with a regarding thermomediterranean to mesomediterranean ecology regions, to obtain optimum a high apricot production.

In the end, a special effort should be made to support improve breeding programs with a focus on selecting varieties with low chilling requirements and late blooming time that would be more suitable for planting of apricot in the Mediterranean regions, including Palestine.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. ECSRC. Malatya Apricot Report. Association of Education, Culture and Social Research Center for Information Highway Press, MalatyaTurkey. (in Turkish); 2009.
2. Gunduz O, Ceyhan V, Bayramoglu Z. Influence of Climatic Factors on Apricot (*Prunus armeniaca* L.) Yield in the Malatya Province of Turkey. Asian Journal of Agricultural Sciences. 2011;3(2):150-155.
3. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Assessing Crop Yield Sustainability under the Climatic and Bioclimatic Change in the Area of Palestine. American Journal of Climate Change. 2015;4:48-56.
   Available:http://dx.doi.org/10.4236/ajcc.2015.41005.
4. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Effect of Biology and Bioclimatology Applied Studies on Plant in the Area of Jerusalem in Palestine. International Journal of Research Studies in Biosciences. 2015g;3:135-140.
   Available: http://www.arcjournals.org.
5. Ozkan B, Akcaoz H. Impacts of climate factors on yields for selected crops in the Southern Turkey. Mitigat. Adapt. Strat. Global Change. 2000;7(4):367-380.
6. Arakelyan B. Excavations at Garni, 1949–50", p. 29 in Contributions to the Archaeology of Armenia. Henry Field (ed.). Cambridge; 1968.
7. Zohary Daniel; Hopf Maria; Weiss Ehud. Domestication of Plants in the Old World. Oxford University Press. 2012;144.
8. Huxley A. ed. New RHS Dictionary of Gardening. Macmillan.1992;1:203-205. ISBN 0-333-47494-5.
9. Giraud Tatiana, Decroocq Veronique. The complex evolutionary history of apricots: Species divergence, gene flow and multiple domestication events. Molecular Ecology. 2019;28(24):11–25.
10. Food and Agriculture Organization of the United Nations, Statistics Division (FAOSTAT). Production Quantities of Apricots by Country in 2017; Crops/World Regions/Production Quantity from picklists; 2018.
    Available:http://www.fao.org/faostat/en/#data/QC.
11. Ana Cano Ortiz, Ighbareyeh JMH, Cano E. Bioclimatic Applications and Soil Indicators for Olive Cultivation (South of the Iberian Peninsula). Global Advanced Research Journal of Agricultural Science. 2014;3:433-438.
    Available: http://garj.org/garjas/index.htm.
12. Jehad MH Ighbareyeh, Asma AA Suliemieh, Mohammed MH Ighbareyeh, Eusebio Cano Carmona, Ana Cano O. (2019). Olive (*Olea europaea* L.) of Jerusalem in Palestine. Trends Tech Sci Res. 2019;3(3):555617.
    DOI: 10.19080/TTSR.2019.03.555617.
13. Ighbareyeh JMH, Cano-Ortiz A, Cano E. Case Study: Analysis of the Physical Factors of Palestinian Bioclimate. American Journal of Climate Change. 2014b;3;223-231.
    Available:http://dx.doi.org/10.4236/ajcc.2014.32021.

14. Ighbareyeh JMH,Cano-Ortiz A, Cano Carmona E, Suliemieh AAA, Ighbareyeh MMH. Flora endemic rare and bioclimate of Palestine. Open Access Library Journal. 2017a;4:e3977. Available:https://DOI:10.4236/oalib.1103977.
15. Ighbareyeh JMH, Cano Carmona E. A Phytosociological of Plant Communities and Biodiversity in the East-South of Idna Village- Hebron of Palestine. International Journal of Geosciences. 2018;9:44-58. Available:https://doi.org/10.4236/ijg.2018.91003.
16. Ighbareyeh Jehad MH, et al. Grapevine (*Vitis vinifera* L.) Yield and Climate Conditions of Palestine. Current Science, [S.l.]. 2018b;114(8). ISSN 0011-3891. Available:http://www.currentscience.org/index.php/CS/article/view/285.
17. Ighbareyeh JMH, et al. Impact of bioclimatic and climatic factors on *Ficus carica L*. yield: increasing the economy and maintaining the food security of Jerusalem in Palestine. Transylvanian Review. 2018d;XXVI(34):8719. Available:http://transylvanianreviewjournal.org/index.php/TR/article/view/3235.
18. Ighbareyeh JMH, Cano-Ortiz A, Cano E. Endemic plant species in the west of Hebron, Palestine. European Journal of Applied Sciences. 2021;9(3):368-385.
19. Jehad Mahmoud Hussein Ighbareyeh, Asma Abdel-Raheem Ahmad Suliemieh, Azhar Mousa Abu Ayash, Maen Nimer Sheqwara, Ana Cano Ortiz, Eusebio Cano Carmona. Biodiversity and Phytosociological Analysis of Plants in Wadi Al-Quf Nursery Reserve North - Western of Hebron City in Palestine. Journal of Plant Sciences. 2021;9(1):13-24. DOI: 10.11648/j.jps.20210901.13.
20. Cano Eusebio, Cano Ortiz Ana, Piñar Fuentes Jose Carlos, Ighbareyeh JMH, Quinto Canas Ricardo. "Didactic Aspects in the Teaching of Vegetation in Secondary and High School Education" International Journal of Humanities Social Sciences and Education (IJHSSE). 2021;8(6):1-7. DOI:https://doi.org/10.20431/2349-0381.0806002.
21. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Assessment of Biology and Bioclimatology of Plant to Increase Economic in Palestine. International Journal of Research Studies in Biosciences. 2015a;3:1-8. Available: http://www.arcjournals.org.
22. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Biology and Bioclimatology Applied on Plant in Palestine. International Journal of Research Studies in Biosciences. 2015c;3:79-86. Available: http://www.arcjournals.org.
23. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Effect of Biology and Bioclimatology Applied on Plant in the Area of Jenin at the North of Palestine. International Journal of Research Studies in Bioscience. 2015e;3:1-6. Available: http://www.arcjournals.org.
24. Cano E, Musarella CM, Piñar JC, Ighbareyeh JMH, Martínez Lombardo MC. Application of the bioclimatología to the arrangement agroforestal: the case of the mediterranean olive grove. In: VII International Seminar Biodiversity Management and Conservation - "Planning and management of agricultural and forestry resources" – Book of abstracts. Reggio Calabria: Università "Mediterranea" di Reggio Calabria (Italia); 2013. ISBN: 978-88-89367-87-2.
25. Ighbareyeh JMH, Cano-Ortiz A, Cano E. Biological and bioclimatic basis to optimize plant production: Increased economic areas of Palestine. Agricultural Science Research Journal. 2014a;4:10- 20. Available: http://www.resjournals.com/ARJ.
26. Ighbareyeh J, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Phytosociology with Other Characteristic Biologically and Ecologically of Plant in Palestine. American Journal of Plant Sciences. 2014c;5:3104-3118. Available: http://dx.doi.org/10.4236/ajps.2014.520327.
27. Ighbareyeh JMH, Cano-Ortiz A, Cano Carmona E. Study of Biology and Bioclimatology of Date Palm (*Phoenix Dactylifera* L.) to Optimize Yield and Increase Economic in Jericho and Gaza Cities of Palestine. International Journal of Research Studies in Biosciences. 2015b;3:1-8. Available: http://www.arcjournals.org.
28. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Study Effect of Biology and Bioclimatology

Applied on Plant in the Area of Hebron at the South of Palestine. International Journal of Research Studies in Biosciences. 2015d;3:56-64.
Available: http://www.arcjournals.org.

29. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Study of Climatology and Bioclimatology applied on Plant in Area of Hebron in Palestine. Golden Research Thoughts. International Multidisciplinary Research Journal. 2015f;5(1):2231-5063.
DOI:PREFIX 10.9780/22315063. http://aygrt.isrj.net/.
30. Jehad MH, Ighbareyeh, Cano-Ortiz A, Cano Carmona E, Ighbareyeh Mohammed MH, Suliemieh Asma AA. Modeling of Biology and Bioclimatology Applied on Plant in Palestine. Swift Journal of Agricultural Research. 2015;1(3):021-027.
Available: http://www.swiftjournals.org/sjar.
31. Jehad M.H. Ighbareyeh, et. al, (2016). Study of Biology and Bioclimatology Applied of Apricot (*Prunus Armeniaca* L.): to Increase the Economy and Maintaining Food Security in Palestine International Journal of Research Studies in Biosciences. 2016;4(2):25-33. DOI:DX.DOI.ORG/10.20431/2349-0365.0402004.
32. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E. Modeling of biology and bioclimatology applied studies on plant in Palestine. International Journal of Development Research. 2016a;6:9585-9590.
Available: http://www.journalijdr.com.
33. Ighbareyeh JMH, Cano-Ortiz A, Suliemieh AAA, Ighbareyeh MMH, Cano E, Shahir hijjeh. Effect of bioclimate factors on olive (*Olea Europea* L.) yield: To increase the economy and maintaining food security in Palestine. International Journal of Development Research. 2016b;6:10648-10652.
Available: http://www.journalijdr.com.
34. Ighbareyeh JMH, Cano-Ortiz A, Cano Carmona E, Ighbareyeh Mohammed MH, Suliemieh Asma AA, Shahir Hijjeh. Impact of Bioclimate and climate factors on plant yield in the area of Jenin at the north of Palestine. International Journal of Current Research. 2017;9 44529-44535.
Available: http://www.journalcra.com.
35. Ighbareyeh JMH, Carmona EC. Impact of Climate and Bioclimate Factors on Apricot (*Prunus armeniaca* L .) Yield to Increase Economy and Achieve Maintaining Food Security of Palestine. Open Access Library Journal. 2017b;4:e4119.
Available:https://doi.org/10.4236/oalib.1104119.
36. Ighbareyeh JMH, Carmona EC. Impact of Environment Conditions on Grapevine (*Vitis vinifera* L.): To Optimal Production and Sustainability, Achieving Food Security and Increasing the Palestinian Economy. Journal of Geoscience and Environment Protection. 2018a;6:62-73.
Available:https://doi.org/10.4236/gep.2018.62005.
37. Ighbareyeh JMH, Carmona EC, Ortiz AC. et al. Analysis of physical factors of climate and bioclimate and their effects on almonds production to increase the economy in Hebron area of Palestine Arab J Geosci. 2018c;11:683.
Available:https://doi.org/10.1007/s12517-018-4026-0. Springer.
38. Ighbareyeh JMH. Bioclimate of Jericho in Palestine. Palestine Technical University Research Journal. 2019;7(1):1-7.
Available:http://www.ptuk.edu.ps.
39. Ighbareyeh JMH, Ighbareyeh MMH, Suliemieh AAA, Daraweesh AQ, Cano Carmona E, Cano Ortiz A. Peach (*Prunus persica* L. Batsch) production and environmental conditions in Jenin, Palestine. Net J Agric Sci. 2019a;7(2):78-8, DOI: 10.30918/NJAS.72.19.02.
40. Cano E, Cano-Ortiz A, Musarella CM, Piñar Fuentes JC, Ighbareyeh JMH, Leyva Gea F, del Río S. Mitigating Climate Change Through Bioclimatic Applications and Cultivation Techniques in Agriculture (Andalusia, Spain), Springer Nature Singapore Pte Ltd. M. K. Jhariya et al. (eds.), Sustainable Agriculture, Forest and Environmental Management; 2019.
Available:https://doi.org/10.1007/978-981-13-6830-1_2.
41. Rivas Martínez S. Clasificación bioclimática de la Tierra. Folia Bot. Matritensis. 196;16:1-20.
42. Rivas Martinez S. Worldwide Bioclimatic Classification System; 2004. Available: www.globalbioclimatics.org.
43. Rivas Martinez S, Sanchez Mata D, Costa M. North American boreal and western temperate forest vegetation (Syntaxonomical synopsis of the potential natural plant communities of North America, II). Itinera Geobot. 1999;12:5–316.

44. Rivas-Martínez S, Rivas-Sáenz S, Penas A. Worldwide Bioclimatic Classification System. Global Geobotany. 2011;1:1-634.
45. Rivas-Martínez S, Penas A, del Río S, Díaz González T, Rivas-Sáenz S. Bioclimatology of the Iberian Peninsula and the Balearic Islands. In: Loidi J. (eds) The Vegetation of the Iberian Peninsula. Plant and Vegetation. 2017;12(1):29-80. Springer, Cham.
46. Jarque C, Bera A. Efficient tests for normality homoscedasticity and serial independence of regression residuals. Econometric Letters. 1980;6:255-259.
47. Jarque C, Bera A. A test for normality of observations and regression residuals. International Statistical Review. 1987;55:163-172.
48. Shapiro S, Wilk M. An analysis of variance test for normality (complete samples). Biometrika. 1965;52:591-611.
49. Shapiro S, Wilk M, Chen H. A comparative study of various tests for normality. Journal of the American Statistical Association. 1968;63:1343-1372.
50. Stigler Stephen M. The history of statistics: the measurement of uncertainty before 1900. Cambridge, Mass: Belknap Press of Harvard University Press; 1986. ISBN 978-0-674-40340-6.
51. Herstein IN. Topics in algebra, waltham: Blaisdell publishing company; 1964. ISBN 978-1114541016.
52. Nering Evar D. Linear algebra and matrix theory (2nd ed.), New York: Wiley,LCCN 76091646; 1970.
53. Fisher Ronald. Studies in Crop Variation. I. An examination of the yield of dressed grain from Broad balk". Journal of Agricultural Science. 1918;11(2):107–135. DOI:10.1017/S0021859600003750.
54. Viti R, Monteleone P. High temperature influence on the presence of flower bud anomalies in two apricot varieties characterized by different productivity. Acta Hortic. 1995;384:283–289.
55. Richardson EA, Seeley SD, Walker DR. A model for estimating the the completion of rest for ‘Redhaven’ and ‘Alberta’ peach trees. HortScience. 1974;9:331-332.
56. Viti R, Bartolini S, Guerriero R. Apricot floral biology: the evolution of dormancy and the appearance of bud anomalies in several Italian genotypes. Adv. Hortic. Sci. 2006;4:267–274.
57. Ruiz D, Campoy JA, Egea J. Chilling and heat requirements of apricot cultivars for flowering. Environ. Exp. Bot. 61. 2007;254–263.
58. Viti R, Bartolini S, Andreini L. Apricot flower bud dormancy: main morphological, anatomical and physiological features related to winter climate influence. Adv. Hortic. Sci. 2013;27(1–2):5–17.
59. Andrich G, Fiorentini R. Effects of controlled atmosphere on the storage of new apricot cultivars. J. Sci. Food Agr. 1986;37:1203-1208.
60. Trurter AB, Combrink JC, von Mollendorff LJ. Controlled-atmosphere storage of apricots and nectarines. Decid. Fruit Grower. 1994;44:421-427.
61. Ighbareyeh JMH, Cano-Ortiz A, Cano E, Mohammed MH, Ighbareyeh, Asmaa AA. Suliemieh. Effect of Biology, Climatic and Bioclimatic Applied Studies on Plant: to Increase the Economy and Maintaining Food Security in the Jerusalem Occupied of Palestine. International Journal of Research Studies in Biosciences. 2016;4:54-60.
Available:http://www.arcjournals.org.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/73001