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Drought Analysis and Effects on Agriculture in the Finike District of Antalya

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HIGHLIGHTS

- Antalya's Finike disrict is very important especially fruit cultivation.
- Drought analysis based on three-month (SPI-3) and six-month (SPI-6) time series.
- The results of the temperature trend analysis revealed an upward trend in temperatures across all periods.
- From the agricultural perspective, it was determined that plant water consumption will increase during the summer months in Finike.

Abstract

This study was conducted in the Finike district of Antalya province in the Mediterranean Region of Türkiye. Finike is important in terms of agricultural production, especially fruit cultivation. Therefore, a drought and trend analysis were carried out for the Finike district to determine the potential impact of climate change, which has started to show its negative effects increasingly in recent years. The Standardised Precipitation Index (SPI) drought analysis was carried out using monthly total precipitation data between 1970 and 2023. The drought analysis was planned according to three-month (SPI-3) and six-month (SPI-6) time series. The hydrological year (October 1 – September 30) was accepted as the start and end of each year for the study. The three-month drought periods were divided into: October-November-December (P3A), January-February-March (P3B), April-May-June (P3C), and July-August-September (P3D). The six-month periods were similarly categorised as: October through March (P6A) and April through September (P6B). Additionally, three- and six-month periods were created for average, maximum, and minimum monthly temperature values for the years between 1970 and 2023. The Mann-Kendall Trend Analysis test was applied to the index and temperature values obtained in these periods. It was determined with the research that SPI-3 and SPI-6 values generally fell within the "Normal Drought" (ND) severity category, and no statistically significant trend changes were observed. The SPI-3 and SPI-6 values revealed that the longest drought periods occurred during 1972–1974, 1989–1991, and 2015–2017. The three- and six-month analyses showed that there was an increase in the number of drought events and the frequency of severe droughts during the P3C and P6B periods, especially between 2010 and 2023. The results of the temperature trend analysis revealed an increasing trend in temperatures across all periods. From an agricultural perspective, the findings suggest that plant water consumption needs are expected to increase during the summer months in Finike. Therefore, relevant measures must be taken to meet the water requirements of plants during this period. Considering that summer is the period when vegetative development for fruit orchards takes place, the precautions to be taken for drought mitigation and meeting plant water needs are of great importance for agriculture.

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1. Introduction

Drought is defined as a natural phenomenon that occurs when precipitation falls significantly below seasonal averages, negatively affecting land and water resources and disrupting the hydrological balance (MGM 2025). Drought is generally categorised into three types: meteorological drought, agricultural drought, and hydrological drought. Meteorological drought refers to a drought that happens due to a long-term decrease in average precipitation. Agricultural drought is defined as the condition in which the soil does not contain enough water to meet the needs of plants.

Among the most significant impacts of climate change are droughts that are experienced regionally. It is projected particularly in countries with a Mediterranean climate that temperatures will increase, precipitation will decrease, and the number of dry periods will rise. As a country much of whose landmass is under the influence of the Mediterranean climate, Turkey is expected to be among those affected by this situation.

It is projected for the southern regions of Turkey that there will be a decrease in precipitation and an increase in evaporation along the Taurus Mountains range between the years 2071 and 2100 (Demir et al. 2008). With the rising temperatures, a corresponding decrease in rainfall is expected to pose a threat of drought and desertification in some parts of the Mediterranean Region (Öztürk 2002). The study conducted by Cebeci et al. (2019) calculated the drought indices using precipitation and average temperature data from meteorological stations in all 81 provinces of Turkey and concluded that as one moves from the north to the south of Turkey, drought severity increases due to rising temperatures. It can be inferred from this and similar studies that the Mediterranean Region is likely to face a significant risk of drought in the future.

Antalya, a province within the Mediterranean Region, is one of Turkey's most important cities in terms of both agriculture and tourism. It is inevitable, depending on the threat of drought associated with climate change and expected in the Mediterranean Region, that Antalya's water resources and agricultural production will be negatively affected. With a surface area of 20,177 km², Antalya province is a large and significant city (HGM 2023). According to data from the State Hydraulic Works (DSİ), Antalya's surface water flow for the year 2023 was recorded as 12.9 km³/year, and its groundwater potential as 1.2 km³/year. Antalya is not only a significant city in terms of agricultural production, but it also possesses substantial water resources. Therefore, taking precautionary measures against potential droughts that may arise as a result of climate change is of critical importance.

Numerous studies on drought have been conducted in Antalya province, which is located in the Mediterranean Region. For example, researchers such as Dinç et al. (2016), Güner Bacanlı and Akşan (2019), Mehr and Attar (2021), Sekendur (2022), Ceyhunlu (2023), Durmuş and Bulut (2023), and Pekpostalcı et al. (2023) have carried out studies aiming to determine the impact of changes in precipitation or moisture deficits on drought conditions in Antalya province. In this study, a drought analysis was conducted using the Standardised Precipitation Index (SPI), based on the monthly total precipitation amounts between 1970 and 2023 in Finike, one of the most agriculturally important districts of Antalya province.

This study aims to examine the changes in precipitation and temperature values in Finike during 3- and 6-month periods between 1970 and 2023. The study analysed drought using SPI values for both 3-month and 6-month time series. Additionally, the Mann-Kendall Trend Analysis method was applied to the SPI index and temperature data for the 1970–2023 period.

2. Materials and Methods

2.1. Study Area and Climate Characteristics

This study was conducted in Finike, one of the most agriculturally important districts of Antalya province in the Mediterranean Region of Turkey. The central coordinates of Finike are approximately 36° 17' 58" N latitude and 30° 08' 44" E longitude. The district is bordered by the Alakır River and Kumluca to the east, Avlan Pass and Elmalı to the north, Alacadağ and Gülmez Mountain with Kale to the west, and the Mediterranean Sea to the south. While the Mediterranean climate generally dominates Finike, the inland areas do not fully experience its effects due to the district's mountainous geography (FK 2023). The total surface area of Finike is 652 km², of which 71.0 km² is used for agricultural purposes (TÜİK 2023). Agriculture is one of the main sources of the economy in the district. The distribution of agricultural land in Finike is approximately as follows: 70.0% for fruit cultivation (primarily citrus), 10.5% for field crops (such as wheat, barley, vetch, and oats), 9.0% for greenhouse vegetable production, and 6.0% for fallow land (FK 2023). This indicates that fruit farming is heavily practised in the district.

To conduct drought and trend analyses in Finike, meteorological data were obtained from the Turkish State Meteorological Service (MGM 2024). Specifically, daily and monthly data between 1970 and 2023, covering precipitation, average temperature, maximum temperature, minimum temperature, relative humidity, wind speed, and sunshine duration, were collected from Finike's meteorological station (Station No. 17375) of the Antalya Regional Directorate of Meteorology. Some long-term averages of these meteorological variables obtained from this station are presented in Table 1. According to long-term data, the highest average temperatures in Finike are experienced in July and August, while January is the coldest month. Regarding monthly total precipitation, the highest rainfall occurs in January and December, whereas the lowest precipitation is recorded in July and August.

Table 1. Average meteorological over many years data of Finike district (MGM 2024).

Month	Precipitation (mm)	Average Temperature (°C)	Maximum Temperature (°C)	Minimum Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)
January	204,9	11,4	16,3	7,3	68,0	1,9
February	145,7	11,7	16,7	7,3	66,7	1,9
March	81,8	13,6	18,9	8,7	67,4	1,8
April	43,7	16,7	22,3	11,3	66,0	1,8
May	18,4	20,6	26,5	14,9	66,3	1,6
June	8,4	25,0	31,4	18,8	62,4	1,6
July	2,0	28,2	34,5	21,7	61,1	1,6
August	1,4	28,3	34,5	21,9	60,3	1,6
September	10,4	25,4	31,7	18,9	61,4	1,7
October	63,5	21,1	27,1	15,3	63,2	1,6
November	122,8	16,4	22,2	11,6	64,0	1,6
December	213,6	12,9	18,0	8,7	65,5	1,8

2.2. Standardised Precipitation Index (SPI)

Agricultural drought analysis was conducted in this study using the meteorological data of the Finike district between the years 1970 and 2023. The changes in drought periods over the years were examined using three-month (SPI-3) and six-month (SPI-6) time series. The planning was done considering the start and end of the hydrological year (October 1 – September 30). The hydrological year was divided into four and two semi-annual periods. The defined three-month periods were classified and named as follows: First period: October, November, December (P3A), Second period: January, February, March (P3B), Third period: April, May, June (P3C), Fourth period: July, August, September (P3D). The six-month drought periods were defined and named as: First period: October, November, December, January, February, March (P6A), Second period: April, May, June, July, August, September (P6B).

The SPI is an empirical equation used to identify drought periods over defined time intervals. The selected periods must span at least 30 years. SPI is calculated by dividing the difference between the total precipitation and the mean precipitation over a given period by the standard deviation of precipitation. Accordingly, Equation 1 (McKee et al. 1993; Alsenjar et al. 2022) was used in this study to determine SPI.

$$SPIij\_k = \left(\frac{Xij - \mu j}{\sigma j}\right) \quad \text{Eq. (1)}$$

where, Xij is the observed precipitation (in mm) for the time-scale k in the month j (j=1, 2, 3, …, 12) of the year i (i=1, 2, …, n); μj and σj are population parameters of the precipitation series, i.e., the expected value and the standard deviation of precipitation in month j, respectively (Alsenjar et al. 2022).

When calculating SPI for periods of 12 months or shorter, the precipitation series is normalised to follow a standard distribution due to the non-homogeneous nature of precipitation distribution in such short intervals. Dry and wet periods within the selected time frames are represented as linear increases or decreases by standardising SPI values (Kıymaz et al. 2011). Following the determination of the SPI, periods in which the index values are continuously negative are defined as "drought periods", while periods in which they are continuously positive are defined as "wet periods". The month in which the index value falls below zero marks the beginning of the drought, and the month in which it reaches a positive value indicates the end of the drought (McKee et al. 1993). Accordingly, the classification of wet and dry periods and the colours representing each category are presented in Table 2 (MGM 2024).

Table 2. Drought classification based on SPI (McKee et al. 1993).

SPI	Drought Class/Category	Colour
> 2,00	Exceptional Humid	
1,60 - 1,99	Extreme Humid	
1,30 - 1,59	Very Humid	
0,80 - 1,29	Moderate Humid	
0,51 - 0,79	Mild Humid	
0,50 - (-0,50)	Near Normal	
(-0,51) - (-0,79)	Mild Drought	
(-0,80) - (-1,29)	Moderate Drought	
(-1,30) - (-1,59)	Severe Drought	
(-1,60) - (-1,99)	Very Severe Drought	
< (-2,00)	Exceptional Drought	

Monthly total precipitation data covering at least 30 years is required to calculate SPI values. The monthly precipitation series is calculated in meters (m). Time series were determined for 3-month and 6-month intervals in this study. To calculate SPI, the obtained precipitation data must be normalised. For this purpose, the Gamma distribution was used in the study. The Gamma distribution is defined as a probability density function or frequency distribution function (Thom 1958). Equation 2 was used for the density and probability function (Alsenjar et al. 2022).

$$g_{(x)} = \frac{1}{\beta^{\alpha}\Gamma(\alpha)} x^{\alpha-1} e^{\frac{-x}{\beta}}, \; x > 0 \quad \text{Eq. (2)}$$

where α and β are the parameters of shape and scale. The gamma function is given as (Alsenjar et al. 2022):

$$\Gamma(\alpha) = \int_0^{\infty} x^{\alpha-1} e^{-x} dx \quad \text{Eq. (3)}$$

The optimal values of α and β are estimated as (Alsenjar et al. 2022):

$$\alpha = \frac{1}{4A}\left(1 + \sqrt{1 + \frac{4A}{3}}\right) \quad \text{Eq. (4)}$$

$$\beta = \frac{\bar{X}}{\alpha}$$

$$A = ln(\overline{x}) - \frac{\sum ln(x)}{n}$$

In this equation, n represents the length of the time series (number of years) (Tigkas et al. 2022).

The probability estimates calculated using this distribution are then used to determine the cumulative probability of the observed values for each month (Kıymaz et al. 2011). It is ensured, by standardising the SPI values, that both temporal and spatial variability in the precipitation series from meteorological observation stations is taken into account for the analysis (McKee et al. 1995; Kıymaz et al. 2011).

2.3. Mann-Kendall Trend Analysis Test

This method is considered a monotonic (uniform) test. It is a statistical approach commonly used in hydrometeorological data to determine whether a significant trend exists or not (Mann 1945; Kendall 1948; Avşaroğlu et al. 2021). This method is tested against the null hypothesis (H_0), which assumes that "no trend exists" in the time series.

3. Results and Discussion

3.1. Three-Month Drought, Temperature Changes, and Trend Analysis

The average, maximum, and minimum temperature values for the Finike district between the years 1970–2023 have been categorised into three-month periods (P3A, P3B, P3C and P3D). The temporal changes in these temperature values are presented in Figure 1. In addition, the results of the Mann-Kendall Trend Analysis applied to these values are provided in Table 3.

In Finike, temperature changes over three-month periods show a linear increase across all periods (Figure 1). Notably, during the P3D period, the minimum temperature shows a more pronounced linear increase compared to the other periods and temperature categories. The results of the Mann-Kendall test applied to the temperature data reveal that all periods exhibit an increasing temperature trend (Table 3). It is observed, based on these results, that the trend in average and minimum temperatures is stronger than that of the maximum temperatures. This can be attributed to the significant increase in minimum temperature values.

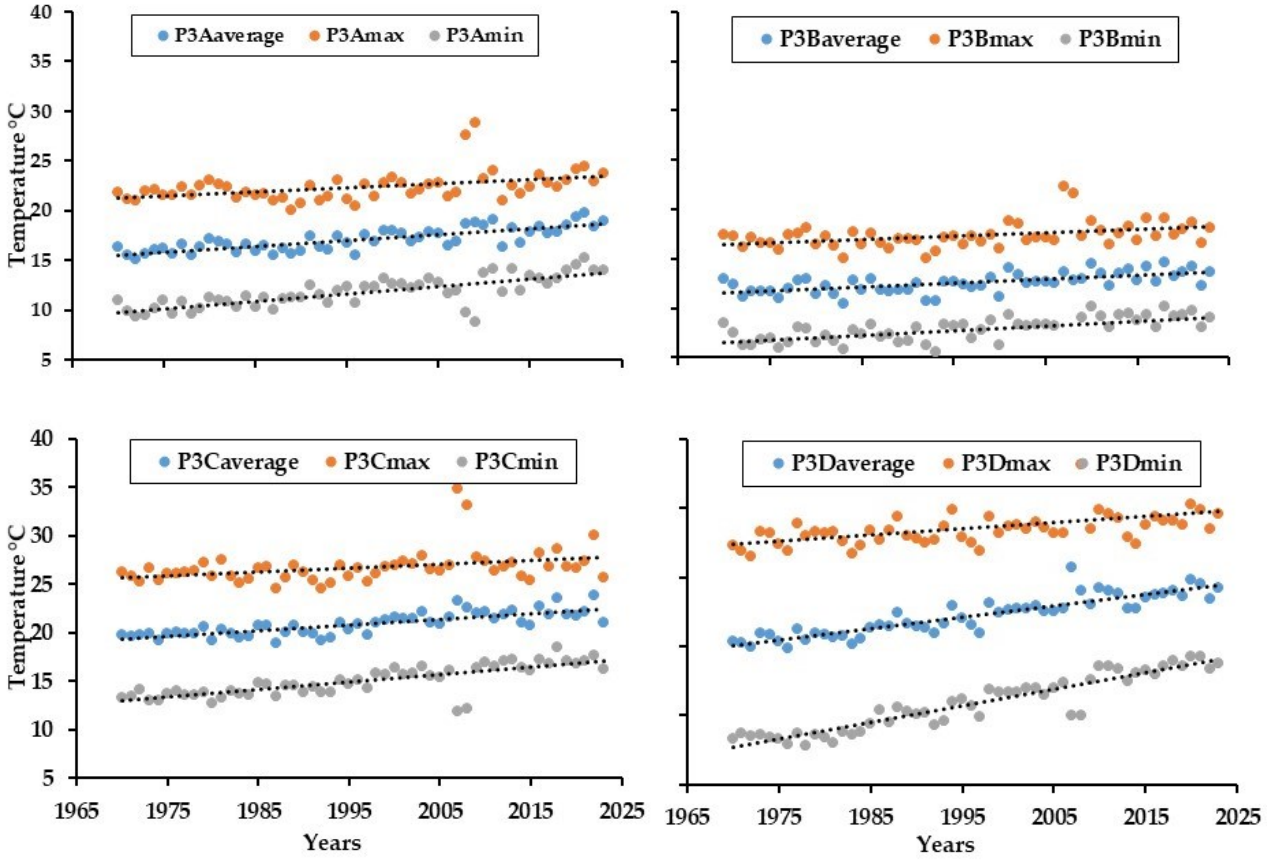

Figure 1. Temporal variation of average, maximum and minimum temperatures over 3-month periods.

Table 3. Trend analysis of 3-month average, maximum and minimum temperature values in Finike. district.

Temperature level	3-month period	Kendall's Tau	S	Var (S)	P (α) Value	Trend	Şen Slope
Average temperature °C	P3A	0,590	845	17967	0,00	↑	0,058
	P3B	0,454	649	17967	0,00	↑	0,040
	P3C	0,607	869	17967	0,00	↑	0,059
	P3D	0,726	1039	17967	0,00	↑	0,081
Maximum temperature °C	P3A	0,347	497	17967	0,00	↑	0,034
	P3B	0,282	403	17967	0,00	↑	0,028
	P3C	0,300	429	17967	0,00	↑	0,029
	P3D	0,427	611	17967	0,00	↑	0,036
Minimum temperature °C	P3A	0,621	889	17967	0,00	↑	0,079
	P3B	0,423	605	17967	0,00	↑	0,052
	P3C	0,646	925	17967	0,00	↑	0,083
	P3D	0,786	1124	17967	0,00	↑	0,121

Note: The ↑ sign indicates an increasing trend, the ↓ sign indicates a decreasing trend, and the - sign indicates no trend.

The SPI-3 drought analysis, conducted using the monthly total precipitation data from 1970 to 2023, is presented in Figure 2. It is observed that the drought severity remains at the "Normal Drought" level and does not show any significant variation over time (Figure 2). The study conducted by Dinç et al. (2014) determined that the average precipitation amounts in the districts of Antalya between 1970 and 2014 did not change significantly. This finding is similar to the results obtained for the Finike district.

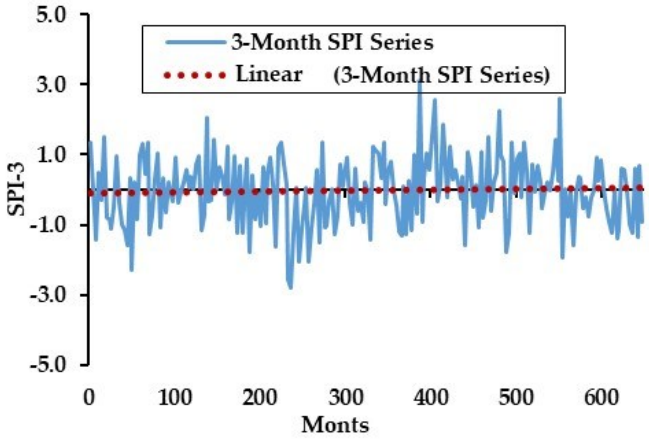

Figure 2. Temporal variation of SPI-3 in Finike district for a 3-month time scale.

In Finike, the years 1970–2023 were divided into 20-year periods, and the changes in the number of drought severity levels were presented in Table 4. It was found that a total of 66 drought periods occurred during this time (Table 4). Among these, it was observed that the droughts occurred mostly at the "Moderate Drought" level in all 20-year periods. When SPI-3 droughts were examined in 20-year intervals, it was found that the highest number of drought events occurred between 1970–1979. However, the analysis of drought periods during 2010–2023 indicates that the number of drought events in this relatively short period nearly matches previous 20-year intervals, and that the frequency of more severe droughts (Severe Drought and Very Severe Drought) has increased.

Table 4. Temporal variation of SPI-3 intensities in Finike district.

Years	Mild Drought	Moderate Drought	Severe Drought	Very Severe Drought	Exceptional Drought	Total
1970-1989	3	16	1	2	3	25
1990-2010	5	12	4	1	1	23
2010-2023	5	8	3	2	0	18
1970-2023	13	36	8	5	4	66

When the SPI-3 droughts in Finike between 1970 and 2023 are evaluated every year, it is observed that the longest drought periods occurred in the years:1972–1974, 1988–1990, 1999–2001, 2015–2017, and 2019–2021. In the specified years, two or more SPI-3 droughts were experienced within a single year. In a nationwide study conducted by Türkeş (2012), the years 1971–1974, 1983–1984, 1989–1990, 2007–2008, as well as 1996 and 2001, were found to be the driest periods in Turkey due to rainfall deficits. Accordingly, the most severe SPI-3 drought periods in Finike correspond well with these findings.

The temporal variation of SPI-3 values divided into four different periods is presented in Figure 3, and the number and variation of drought severity levels in 20-year time intervals are shown in Table 5. In addition, the Mann-Kendall trend analysis applied to SPI-3, P3A, P3B, P3C, and P3D values is presented in Table 6.

When analysing the temporal change in drought severity of SPI-3 periods, it is observed that drought at the "Normal Drought" level was experienced in all periods (Figure 3). Similarly, a comparable number of droughts occurred in the P3A, P3C, and P3D periods (Table 5). However, the severity of droughts was higher in the P3C and P3D periods. Although the P3B period had a lower number of droughts, the number of high-severity droughts (Severe Drought and Exceptional Drought) was relatively greater.

When the number of droughts by severity level in 20-year periods between 1970 and 2023 in Finike is examined, the 1970–1990 period appears to have experienced the highest number of droughts in all periods

(Table 5). However, during 2010–2023, the frequency of droughts in P3B and P3C periods shows an increasing trend compared to the other 20-year intervals. However, it should be noted that no high-severity droughts (Severe Drought, Very Severe Drought and Exceptional Drought) occurred during this period.

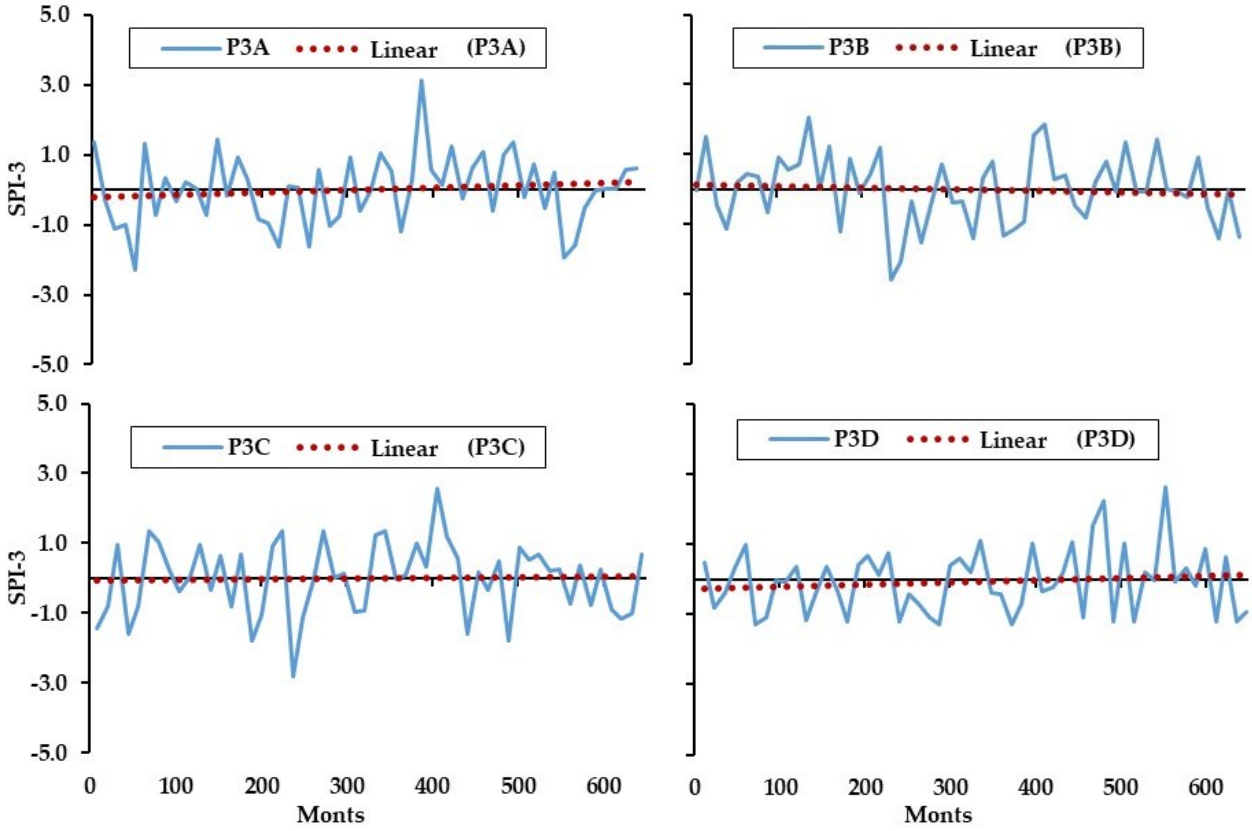

Figure 3. Temporal variation of SPI-3 periods in Finike district.

Table 5. Temporal variation of SPI-3 period intensities in Finike district.

Periods	Years	Mild Drought	Moderate Drought	Severe Drought	Very Severe Drought	Exceptional Drought	Total
P3A	1970-1989	2	4	0	1	1	8
	1990-2010	3	2	0	1	0	6
	2010-2023	2	0	1	1	0	4
	1970-2023	7	6	1	3	1	18
P3B	1970-1989	1	2	0	0	1	4
	1990-2010	0	3	3	0	1	7
	2010-2023	1	0	2	0	0	3
	1970-2023	2	5	5	0	2	14
P3C	1970-1989	0	4	1	1	1	7
	1990-2010	0	3	1	0	0	4
	2010-2023	2	3	0	1	0	6
	1970-2023	2	10	2	2	1	17
P3D	1970-1989	0	6	0	0	0	6
	1990-2010	2	4	0	0	0	0
	2010-2023	0	5	0	0	0	0
	1970-2023	2	15	0	0	0	17

According to the Mann-Kendall trend analysis test, no statistically significant trend changes were observed in SPI-3 and other period values (Table 6). Although a decrease was observed in the P3B and P3C periods, this was not statistically significant. The increase in drought frequency during these periods in 2010–2023 may be a possible reason for the observed decrease.

Table 6. Mann Kendall Trend analysis of SPI-3 and its periods.

Indices	Kendall's Tau	S	Var (S)	P (α) Value	Trend	Şen Slope
SPI-3	0,031	727	1127445	0,49	-	0,000
P3A	0,104	149	17967	0,27	-	0,010
P3B	-0,065	-93	17967	0,49	-	-0,006
P3C	-0,004	6	17966	0,97	-	-0,000
P3D	0,107	153	17954	0,26	-	-0,008

Note: The ↑ sign indicates an increasing trend, the ↓ sign indicates a decreasing trend, and the - sign indicates no trend.

3.2. Six-Month Drought, Temperature Changes, and Trend Analysis

The temporal changes in average, maximum, and minimum temperature values for 6-month periods (P6A and P6B) are presented in Figure 4. Additionally, the results of the Mann-Kendall trend analyses applied to these values are presented in Table 7.

In the Finike district, a linear increase in 6-month temperature values is observed in all periods (Figure 4). Particularly, in the P6B period, the minimum temperatures reveal a stronger linear increase compared to other periods and temperature levels. The Mann-Kendall test results indicate an increasing trend in temperature values in all periods (Table 7). According to these results, the trend increase in average and minimum temperature levels in all periods is stronger than that of maximum temperature levels. This can be attributed to the fact that minimum temperatures are increasing.

The temporal distribution of SPI-6 drought analyses, performed using monthly total precipitation data, is presented in Figure 5. The drought severity in Finike is observed to remain at the "Normal Drought" level with no significant changes (Figure 5). The study conducted by Mahnamfar and Nigussie (2023) obtained similar results for Antalya province using the SPI drought analysis method over different time intervals.

When SPI-6 droughts are evaluated on an annual basis, the longest droughts were observed in the years 1972-1974, 1988-1991, 2000-2001, and 2016-2018. During these years, SPI-6 droughts occurred twice within a single year. Considering the years in which SPI-6 droughts (Figure 5) were most frequent, there is a parallel with the years when SPI-3 droughts (Figure 2) were most frequent.

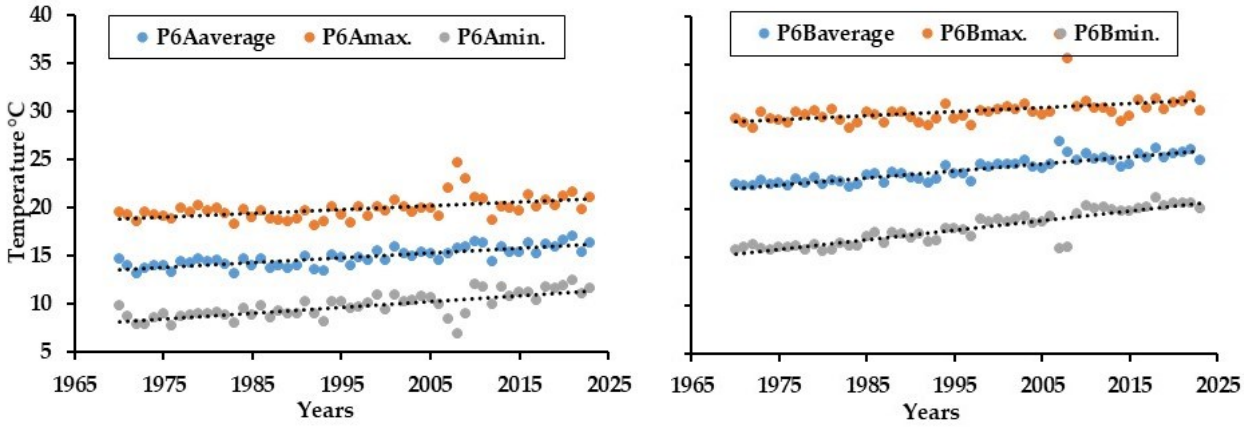

Figure 4. Temporal variation of average, maximum and minimum temperatures over 6-month periods.

Table 7. Trend analysis of 6-month average, maximum and minimum temperature values in Finike district.

Temperature level	6-month period	Kendall's Tau	S	Var (S)	P (α) Value	Trend	Şen Slope
Average temperature °C	P6A	0,595	851	17967	0,00	↑	0,049
	P6B	0,716	1025	17967	0,00	↑	0,069
Maximum temperature °C	P6A	0,379	543	17967	0,00	↑	0,032
	P6B	0,455	651	17967	0,00	↑	0,034
Minimum temperature °C	P6A	0,572	819	17967	0,00	↑	0,064
	P6B	0,737	1055	17967	0,00	↑	0,101

Note: The ↑ sign indicates an increasing trend, the ↓ sign indicates a decreasing trend, and the - sign indicates no trend.

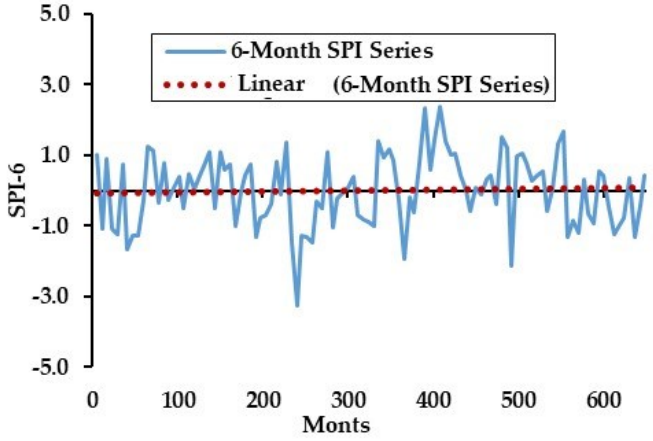

Figure 5. Temporal variation of SPI-6 in Finike district for a 6-month time scale.

The changes in the number of SPI-6 drought intensity events in the Finike district between 1970 and 2023, divided into 20-year periods, are presented in Table 8. These results show that a total of 36 drought periods occurred (Table 8). It is observed that these drought periods mostly occurred at the "Moderate Drought" intensity level across all 20-year periods. When SPI-6 droughts are examined in 20-year intervals, the numbers are seen to be similar. However, drought periods experienced between 2010 and 2023 have rapidly approached the numbers of other 20-year periods.

Table 8. Temporal distribution of SPI-6 intensities in Finike district.

Years	Mild Drought	Moderate Drought	Severe Drought	Very Severe Drought	Exceptional Drought	Total
1970-1989	3	7	1	2	1	14
1990-2010	4	5	2	1	0	12
2010-2023	2	5	2	1	1	10
1970-2023	9	17	5	3	2	36

The temporal variation of SPI-6 values is shown in Figure 6, while the numbers and changes in drought intensity over 20-year time intervals are presented in Table 9. Additionally, the results of the Mann-Kendall trend analysis test applied to SPI-6 and its P6A and P6B values are presented in Table 10.

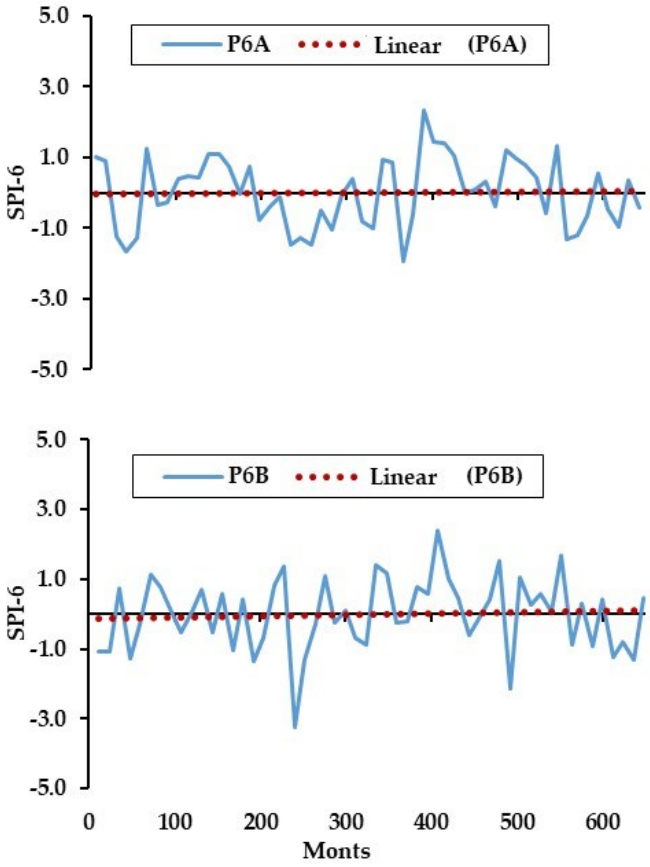

Figure 6. Temporal variation of SPI-6 periods in Finike district

The temporal variation of drought severity during the SPI-6 periods reveals that droughts of "Normal Drought" intensity occurred in all periods (Figure 6). An equal number of droughts were identified in the P6A and P6B periods (Table 9). However, more droughts were recorded in the P6B period between 1970 and 1979. The majority of these droughts were of "Moderate Drought" intensity. Between 1990 and 2009, more droughts occurred during the P6A period, again mostly of "Moderate Drought" intensity. In the years 2010-2023, droughts were experienced equally in both periods. However, during the P6B period, there was one times "Severe Drought" and one times "Exceptional Drought". Compared to other 20-year periods, this indicates an increase in the frequency of high-intensity six-month droughts.

According to the Mann-Kendall trend analysis test results for SPI-6 values and their sub-periods, no statistically significant trend changes have occurred compared to other periods (Table 10).

Table 9. Temporal variation of SPI-6 period intensities in Finike district.

Periods	Years	Mild Drought	Moderate Drought	Severe Drought	Very Severe Drought	Exceptional Drought	Total
P6A	1970-1989	1	2	1	1	0	5
	1990-2010	2	4	1	1	0	8
	2010-2023	2	2	1	0	0	5
	1970-2023	5	8	3	2	0	18
P6B	1970-1989	2	5	1	0	1	9
	1990-2010	2	2	1	0	0	4
	2010-2023	0	2	1	0	1	5
	1970-2023	4	9	3	0	2	18

Table 10. Mann Kendall Trend analysis of SPI-6 and its periods.

Indices	Kendall's Tau	S	Var (S)	P (α) Value	Trend	Şen Slope
SPI-6	0,021	123	141881	0,75	-	0,001
P6A	-0,003	-5	17967	0,98	-	0,000
P6B	0,046	60	17966	0,66	-	0004

Note: The ↑ sign indicates an increasing trend, the ↓ sign indicates a decreasing trend, and the - sign indicates no trend.

4. Conclusions

This study was conducted in the Finike district in the Mediterranean Region of Antalya. Finike is important in terms of agricultural production, especially fruit cultivation. Therefore, drought and trend analyses were performed to determine the potential impact of climate change, which has started to show its adverse effects more effectively in recent years, on Finike.

Statistically significant increases were observed in the average, maximum, and minimum temperature values in Finike between 1970 and 2023. The strongest increases were found in the minimum temperature values during the P3D and P6B periods. This indicates a rising trend in nighttime temperatures over the years in Finike. From an agricultural perspective, this suggests an increased water consumption demand by plants during the summer period, implying that plant water use will rise accordingly. Therefore, necessary measures should be taken to meet the increased water requirements during this period.

Additionally, SPI-3 and SPI-6 drought analyses were conducted using precipitation data from 1970 to 2023. According to the results, no statistically significant changes were observed in SPI-3, SPI-6, and other periods overall. However, an increase in both the frequency and severity of droughts was recorded in the P3C period during 2010-2023, which indicates the possibility of severe SPI-3 droughts occurring in this period in the coming years. Since the P3C period corresponds to the vegetative growth period of summer crops, this finding is of great agricultural importance.

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