The survey of growing season length trend and its zoning in Iran

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Abstract
Growing cycle is a cycle that it's during enough humidity, lack of thermal limits; make the production of agricultural crops possible. Evidences show that time of germination season is getting longer about 10-20 days in recent decade. So that early starting is noticeable. This increase of germination season is associated with global warming. The general goal of this article is the survey of changes and zoning of growing season length based on thermal bases 5° and 10°c in 31 Iran synoptic stations during 20 years common statistical cycle using at least daily temperature from 1961 to 2009 DC (1366 -1386 Solar month). In this study is used 49 years data of Iran synoptic stations (1961-2009) to study how is starting and ending of changes trend and germination season length thermal bases 5° and 10° c. the random data is tested by Man-Cendal test, and the series having changes or trend with reliability level 0.05 α are determined. Then by the Man-Cendal graphical test how and starting time of trend or changes is determined and changes value measured. The research result show more changes in the series related to the starting and the ending of germination season with thermal bases 10°c to series with 5c°. In spite of other stations, Oroomiyeh, Khoramabad, Saghez, Shahrekord is faced with decreasing of germination season. Zoning maps showed that growing season length in the studied area is decreased from south to west and west north, so that in the studied thermal bases, Bandarabas station has longest and Shahrekord station has shortest growing season length among other stations.

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Introduction

Already it has widely accepted that greenhouse gases are increased in earth atmosphere in recent decades. The main impact the increase of greenhouse gases is caused by an increase of weather temperature (Zhang and Colleagues 2008, Basistha et al, 2009) and Deni et al 2010).

During 20th century the average global temperature is increased between 0.6-2.8°C that the most increasing was between 1976-2000 and this increase from 1990 to 2100 years, will reach 1.4 to 5.8 °C (I.P.C.C, 2001). Among this increase of global weather, Temperature, most of the phonological.

Climatological and satellite research show increase of germination season length result from increasing of temperature in the northern area during 20th (Song and colleagues 2010, Jeong et al 2011). Growing season is the cycle between germination and leaf falling that is particularly expected to get longer in high widths (EET 2004).

The changes of growing season length are useful climatic index and have several important climatic uses (Robeson 2002).

By decreasing of growing season length, it also happened changes in the cultivation time that can be decreased efficiency of agricultural crops. However it is possible that increase of growing season length make prior opportunity and make sure of seedling and even possibility of multitude harvests (considering availability of water). Because temperature is one of the most important elements in making of climate, its changes can be changed weather structure of every places. This is reason why the study of temperature trend in the different spatial and temporal large scale is specialized in climatology research.

The studies of researchers have showed that in most part of the world, temperature had been increasing during last century.

Many studies are done about germination season changes and temperature shifts in the different part of the world.

(Menzel et al, 2001) has studied phonological season in German during 1951-1996 years and found the evidences about early starting of spring (0.23 to 0.28 days in year), however phonological changes had less shifts in the autumn (average 0.3 to 0.1 days in year).

(Fitter2002) has studied the first flowering time of 385 plant species in Britain and concluded that the first flowering time is increased about 4.5 days.

(Kozlov & Berlina 2012) found that the germination season length during last 60 years is decreased resulting from spring delay and development of autumn and winter in the Kola Peninsula. (Jones et al, 2002) has studied sever temperature G.S.L and daily temperature by considering to last years in 18 century for 4 climatology stations (central England, Stockholm, Avasyala and St.petersburg).

They found that germination season in the north of Europe obviously was warmer than last years of 1960. (Yue et al, 2003) has studied monthly, yearly and season temperature of Japan in the last 100 and shown that yearly temperature of 46 stations that is measured by Man-Cendal test is increased from 1900 to 1996 years between 0.51° - 2.77° Celsius. In this cycle, season temperature is increased between 0.47°-3.69° Celsius that most increase is seen in the winter and spring. Dong and colleagues in the study of thermal germination season trend in Taibet desert in China concluded that starting of germination season is advanced about 1.82 days in decade, and germination season length is increased about 3.29 days in decade.

(Beck and colleagues, 2005) using MODISNDVI data have depicted advancing of spring from 2000 to 2004 in Fnvskanady and they found large spatial and temporal differences in this range in the starting of spring more than 2 month in the studied area and more than 1 month during year.
(Linderholm et al, 2006) showed that germination season is increased in Baltic area about 7.4 during 20th century that the largest change is happened during spring season.

**Research method**

To do research at first step was got the statistic of all synoptic stations in Iran that having long time statistic. In regard to, do this research the short time statistical cycle (about 50 years), was considered, 22 stations were left because they had short time statistical cycle or long stops and finally 31 synoptic stations are chosen that having 49 years common statistical cycles (1961-2009).

*Fig. 1. Season Growing changes in Iran.*

Growing season length was measured for thresholds 5° and 10°c. For measuring growing season length the starting and ending date of thermal threshold 5° and 10°c was derived by using Zhylvsy coding (January 20 with code 1 and January 21 the ending of year with code 365).

*Fig. 2. Zonation map of Growing season length in selected stations based on (1) 5 temperature (2)10 temperature.*

**Growing season length**

There are multitude definitions for growing season length. The real growing season length has varied from year to year, and also it is possible growing of agricultural crops is limited to part of this growing season or even out of it. The determining of growing season in every zone has effective role for choosing crops and value and determining of cultivation time and other agricultural decision s. there are multitude definitions for this scope. Anon (1987) stated growing season is as a cycle that enough humidity and lack of thermal limits make production of agricultural crops possible. So 2 important factors for growing cycle are suitable temperature and enough humidity. According to stated definition from the variability group of climatology commission of global weather organization in the north hemisphere, germination cycle is considered time range between the first cycle after July 1st (Tir 10th) that is at least continuous 6 days, the average of daily temperature is more than 5°C and the first 6 days cycle with the average daily temperature less than 5°C. In south hemisphere time range is considered the January 1st. In this research because of different climatic conditions of studied area to use statistics of growing season length in cultivating of plant species that are adaptable to threshold 5°C (cold region plants) and 10°C (tropical plants) separately, the onset of growing cycle, the first 6 day cycles with at least daily temperature(Tmin≥10, Tmin≥5) is considered as the starting of growing cycle (for the onset growing of plant 5°C is necessary) and the last 6 day cycles with at least temperature (Tmin<10, Tmin<5) considered as the ending of growing cycle length.

**Determining trend**

In many researches for determining of trend in short time series can be used climatology and hydrology data.

In this research for determining of trend in data used man-cendal nonparametric test.
The nonparametric methods have advantages to other parametric methods. To do test the steps are as follow:

A: the determining of man cendal statistic value by using following formula.

At first for doing this test statistical series is graded and for change value by trend is used following relation:

\[ T = \frac{P}{N(N-1)} \quad \text{Eq}(1) \]

T is man cendal statistic and N the total number of statistical years and P sum of grades more than of each \( n_i \) row that is place after it.

N: the total number X is of time series.

To measure meaning full of statistic T; critical statistic (t) is measured by the following relation.

\[ t = 0 \pm \text{tg} \quad \text{Eq}(2) \]

tg is the standard variant value (z) is like the possibility level of test which in this research according to possibility of %95 ; \( \text{tg}=1/9 \); and as a result the value of critical zone for 49 years the statistics of zone stations is \( t=/193. \)

If \(-0.193 < T < +0.193\) there is no trend and
If \(t > 0.193\) there is positive trend and
If \(t < -0.193\) there is negative trend

B: graphical Method: for determining of trend direction, kind and change time, we need cendal graphical test. So it is usually used special table.

So that at first data is graded and it statistic (the relation of I grade to prior grade) is measured.

Then we measure accumulation frequency of \( t_i \) statistic and then expected, variance and index of Man-cendal are measured based on following formula:

\[ E_i = \frac{n_i(n_i-1)}{4} \quad \text{Eq}(3) \]

\[ V_i = \frac{n_i(n_i-1)(2n_i+5)}{72} \quad \text{Eq}(4) \]

\[ U_i = \frac{\sum ti - E_i}{\sqrt{V_i}} \quad \text{Eq}(5) \]

For the survey of changes, the U' index should be determined. The measuring steps for U' are as follow1.

Data is graded and \( t_i \) statistic (the relation of I grade to post grade) determine, and then accumulation frequency is measured.

Expected, variance and index of U' is measured by the following formula.

\[ E'_i = \frac{N-(n_i-1)N-n_i}{4} \quad \text{Eq}(6) \]

\[ V'_i = \frac{N-(n_i-1)[N-n_i][2(N-(n_i-1)+5)]}{72} \quad \text{Eq}(7) \]

\[ U'_i = \frac{\sum ti - E'_i}{\sqrt{V'_i}} \quad \text{Eq}(8) \]

In the relations (7), (8) N is a volume of studied statistical sample. In this method, the continuous values of \( u, u' \) result from Man-cendal test is graphically showed that in this graphic if u, u' values of curves cross each other there is not any trend or changes. But if the curves cross each other, the curves of starting trend by changes are approximately showed.

Research finding

The onset of germination season

The understanding of passing date of 5c° is functionally very important. The average of starting date 5c° in the studied station is varied from Bahman 1th in Bandarabas station in the south of Iran to Ordibehesht 16th in Shahrekord stationin in zagros altitudes. The survey of passing date 10c° especially for tropical crops is very important. The average of starting time 10c° in studied station is varied from
Bahman 19th in Boushehr station in the south of Iran to Tir 6th in Sharekord station. The trends by 0.95 reliability levels are showed that it is seen noticeable decrease in the onset of germination season between studied stations.

so that between 31 stations, 11 stations in the onset of germination season in 0.95 reliability level and 5 station in 0.99 reliability level in both thermal thresholds were faced with negative and decreased Trend and 3 stations (Saghez).

Table 1. The result of Man-cendal test and the changing in the happening time of thermal threshold in terms of days in chosen stations.

<table>
<thead>
<tr>
<th>stations</th>
<th>The onset of germination season with thermal threshold 5°C</th>
<th>The ending of germination season with thermal threshold 5°C</th>
<th>The onset of germination season with thermal threshold 10°C</th>
<th>The ending of germination season with thermal threshold 10°C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time and kind of changes</td>
<td>Time and kind of changes</td>
<td>Time and kind of changes</td>
<td>Time and kind of changes</td>
</tr>
<tr>
<td>Abadan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Alvaz</td>
<td>Δd=17.8</td>
<td>CD 998</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Esfahan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Arak</td>
<td>Δd=19.4</td>
<td>CD 2008</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Anzali</td>
<td>Δd=10.9</td>
<td>Cd 1998</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Oroomiye</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Babulsar</td>
<td>-</td>
<td>Δd=18.8</td>
<td>CI 1968</td>
<td>Δd=21.6</td>
</tr>
<tr>
<td>Bandarabas</td>
<td>-</td>
<td>Δd=14.4</td>
<td>CI 1990</td>
<td>Δd=21.4</td>
</tr>
<tr>
<td>Busheer</td>
<td>Δd=4.1</td>
<td>CD 1974</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Birjand</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tabriz</td>
<td>Δd=11.5</td>
<td>CD 1968</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tehran</td>
<td>Δd=10.1</td>
<td>CD 1998</td>
<td>Δd=10.4</td>
<td>CI 1983</td>
</tr>
<tr>
<td>Khoramabed</td>
<td>Δd=18.9</td>
<td>CD 1976</td>
<td>Δd=11.8</td>
<td>CD 1976</td>
</tr>
<tr>
<td>Khoıy</td>
<td>-</td>
<td>Δd=13.7</td>
<td>CI 1975</td>
<td>Δd=10.9</td>
</tr>
<tr>
<td>Sabzevar</td>
<td>Δd=16.9</td>
<td>CI 1996</td>
<td>-</td>
<td>Δd=19.9</td>
</tr>
<tr>
<td>Shahrood</td>
<td>Δd=13.2</td>
<td>CD 2001</td>
<td>Δd=14.1</td>
<td>CI 1987</td>
</tr>
<tr>
<td>Sharekord</td>
<td>Δd=17.3</td>
<td>CD 2003</td>
<td>Δd=17.3</td>
<td>CD 2003</td>
</tr>
<tr>
<td>Shiraz</td>
<td>-</td>
<td>Δd=16.4</td>
<td>CI 1996</td>
<td>-</td>
</tr>
<tr>
<td>Ramsar</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rasht</td>
<td>Δd=6.2</td>
<td>CD 2001</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zahedan</td>
<td>-</td>
<td>Δd=16.4</td>
<td>CI 1996</td>
<td>-</td>
</tr>
<tr>
<td>Zanjan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Qazvin</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kerman</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kermanshah</td>
<td>-</td>
<td>-</td>
<td>Δd=7.2</td>
<td>CD 1978</td>
</tr>
<tr>
<td>Gorgan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mashhad</td>
<td>Δd=17.4</td>
<td>CD 2001</td>
<td>Δd=18.9</td>
<td>CI 1994</td>
</tr>
<tr>
<td>Hamadan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yazd</td>
<td>-</td>
<td>Δd=15.3</td>
<td>TI 1991</td>
<td>Δd=12.3</td>
</tr>
</tbody>
</table>

\[ \alpha = 0.95 \quad ** \]

\[ \alpha = 0.05 \quad * \]

Khoramabed,Sharekord) had positive and increased trend. In time series of the onset germination season with 5°C threshold, as showed the result s of table (2), most stations have meaningful, sudden and decrease changes. Except of Khoramabod and Saghez stations that having sudden and increased trend in 1996 and 1976 respectively about 18.9, 16.9 days, other stations show decreased trend. Anzali and Tehran stations had under gone decreased and sudden change about-10.9, -10.1 and respectively , in the last 1990s in the end of 20th century in1998 .in the early 21th century in 2001 in Shahrood, Rasht,Mashhad stations decreased and sudden change is showed-13.2,-6/2, -17.4 days respectively. But Alvaz and Tabriz stations was
showed decreased and sudden changes in 1981, 1988 about -11.5 and 17.8 days respectively. Of course it should be noted that since germination season length in Abadan, Ahvaz, Bandarabas, Busher and Anzaly include all of year and the starting and ending of 5°C and 10°C happen at the same time, in the survey of this stations was only considered to days with temperature less than studied threshold and had studied its changes. The study of series the onset of germination season with 10°C shows that Abadan, Ahvaz, Anzaly and Busher were faced with decreasing of days with temperature less than 10°C in 1994, 1967, 1999 and 1991 respectively about 4.5, 32.4, 10.4, 21.4 days and Esfahan, Babulsar, Bam, Tabriz, Tehran, Sabzevar, Shahrood, Shiraz, Kermanshah, Mashhad and yazd had sudden and decreased changes in 2008, 1999, 2000, 1992, 1970, 1984, 1974, 1978, 1985 and 2008 about -19.4, -21.6, -3.1, -12.1, -19, -10.9, -13.6, -16.1, -7.2, -13.6, 1.3 days, but Khoramabad, Saghez and Shahrekord had sudden and decreased changes in 1981, 1992, 1987 about 12.5, 19.9, 32.2 days (table 1).

**Table 2.** Grouping of growing season length for thermal bases 5°C and 10°C.

<table>
<thead>
<tr>
<th>Group</th>
<th>Germination season length with thermal threshold 5°C</th>
<th>Station</th>
<th>Germination season length with thermal threshold 10°C</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>150 - 200</td>
<td>Oroomye, Khoy, Saghez, Sharekord, Kermanshah, Hamadan</td>
<td>50 - 100</td>
<td>Sharekord, Hamadan</td>
</tr>
<tr>
<td>2</td>
<td>200 - 250</td>
<td>Arak, Esfahan, Birjand, Tabriz, Khoramabad, Sabzevar, Qazvin, Kerman, Mashhad, Zanjan</td>
<td>100 - 150</td>
<td>Oroomineh, Arak, Khoy, Qazvin, Kerman, Kermanshah, Saghez</td>
</tr>
<tr>
<td>3</td>
<td>250 - 300</td>
<td>Tehran, Rasht, Zahedan, Shiraz, Gorgan, Yazd, Shahrood, Mashhad</td>
<td>150 - 200</td>
<td>Esfahan, Birjand, Tabriz, Khoramabad, Zahedan, Shiraz, Sabzevar, Mashhad, Zanjan</td>
</tr>
<tr>
<td>4</td>
<td>300 - 350</td>
<td>Anzali, Bam, Babulsar, Ramsar</td>
<td>200 - 250</td>
<td>Anzali, Babulsar, Tehran, Ramsar, Rasht, Gorgan, Yazd</td>
</tr>
<tr>
<td>5</td>
<td>&gt;350</td>
<td>Ahvaz, Abadan, Badar abas, Bushahr</td>
<td>250 - 365</td>
<td>Busher, Abadan, Bam</td>
</tr>
</tbody>
</table>

**Ending of growing season**

The average of first ending date in 5°C in studied station s is varied from Mehr 12th in Sharekord station to Day 30th in Abadan, Ahvaz, in western south and Bandar abas, Busher in south.

By determining the last date that weather temperature in studied station for 6 days reach to less than 10°C, we can measure the growing season length in 10°C. The average of ending 10°C in the studied station is varied from Shahrivar 13th in Sharekord station for 6 days reach to less than 10°C, to stations with 0.95 reliability level and 6 stations with 0.99 reliability level have positive trend, but Saghez, Sharekord, Khoramabad and Oroomyeh stations show decrease trend. Between times series of germination season ending with threshold 5°C, according to table (1), show the following results:

Except Khoramabad and Sharekord stations that having sudden and decreased changes in 1976, 2003 respectively about - 11.8 and - 17.3 days. Other stations have increased changes. Tehran, Shahrood

The measured change value for them during the length was 10.4, 14.1, and 11.6 respectively.

Bam, Zahedan and Mashhad stations in 1990s in 1990, 1996, 1994 show increased and sudden changes about 14.4, 16.4 and 18.9 days.

Babulsar and Sabzevar stations show sudden and increased changes in 1968, 1975 about 18.8, 13.7 days. Yazd station shows increased and slow changes in 1991 about 12.3 days. Between the series of germination season ending in 10°C, Oroomyeh, Tehran, Khoy, Sabzevar, Shahrood, Shiraz, Kermanshah, Mashhad and Yazd stations except Shiraz station have increased and slow changes in 1979 about 16.7 days.


Growing season length

as it was showed in the series of starting and ending of germination season with threshold 5°C except of khoramabad, saghez, sharekord station that was faced with increasing of germination season length. Other stations that having Meaningful changes, show increasing of germination season.

In Ahvaz, Anzali, Bushehr, days with temperature less than 5°C has increased about 17.8, 10.9, 4.1 days respectively. In Tabriz and Rasht stations only the onset of germination season are started earlier, and in Babulsar, Bam, Sabzevar, Zahedan and Yazd are delayed the ending of germination season. But in Tehran, Shahrood and Mashhad stations have changed the onset and ending of germination season and changes value of germination season had been 20.5, 27.3 and 36.3 days respectively.

Khoramabad station was faced with decreasing of germination cycle length from both sides, so that the germination season is decreased in this station about 30.7 days. Saghez station was faced with delaying in the onset germination season and germination season length in this station is decreased 16/9 days and in Shahrekord station the ending of germination season is advanced and the length of germination season 17.3 days get shorter (table 1). according to table 1, the number of days with temperature less than 10°C in Abadan, Ahvaz, Anzali and Bushehr is decreased -4.5, -32.4, -10.4 and -21.4 days respectively.

Also the onset of germination season in Esfahan, Babolsar, Bam and Tabriz is advanced, and the ending of germination season in Oroomye stations is delayed. Tehran, Sabzevar, Shahrood, Shiraz, Kermanshah, Mashhad and Yazd are stations that germination season is increased from both side, and these values are increased 31.3, 35.4, 31.7, 32.8, 17.4, 30.5 and 25.6 days respectively, that most increases is related to Sabzevar station with 35.4 day. This noticeable change value can have certainly noticeable impact in the life cycles of plants in this zone, and can be followed by noticeable economic impact.

Also Khoramabad, Saghez and Khoramshahr stations had decrease of germination cycle length with 5°C thermal threshold, they show the decrease of germination cycle length with thermal threshold, about 32.1, 24.6 and 45.7 days that the changes value of 3 stations are particularly noticeable in Shahrekord station. In the study it was determined that in 3 stations take place a moving.

Oroomiye station with 10°C shows decrease of germination season. By viewing of result related to the onset and ending of germination season can be concluded that most changes are related to west
south, west and east north of Iran. Between west south and west stations Khoramabad, Shahrekord and Saghez was faced with decreasing of germination cycle length. In west north stations, Tabriz station has 2 noticeable changes, and other stations only have one change, and oroomiye station was faced with decreasing of germination season. Between northern stations Babulsar has only 2 changes, and other stations didn’t have changes or they had only one change. Between central Iran stations and the east of Iran most changes are related to Yazd station (picture 1). The average of growing season length for 5° in studies stations is varied from 151 days, in Shahrekord station to 365 days, in Bandar abbas station (table 2). According to table (2) the average of growing season length in 10°c in studied stations is varied from 69 days in Sharekord station to 347 days, in Bandarabas station.

The classifying of growing season length in the chosen station of country for thermal bases 5° and 10°c For determining homogeneous groups of growing season length for thermal bases 5° and 10°c is considered to zoning group.

By understanding of growing season length of plants in every zone, farmers can cultivate agricultural plants and determine the harvest and cultivate date of crops. Areas that based on 5°c have homogeneous condition s and was placed in the same group. The result of this study is presented in table (2) The growing season length for thermal bases 5° and 10°c is classified into 5 groups and it's zoning maps is depicted. The zoning of growing season length based on 5°c shows that growing season length is increased from the south to west of country (picture 2). In northern area because of nearby Caspian Sea and having humidity and high temperature, growing season length get longer to western areas (picture 2). According to this picture, the zoning of growing season length in 10°c show that the growing season length is more in the southern area and is decreased toward the west. in most studied stations the germination season length is increased in both thermal thresholds, in Khoramabad, Saghez and Sharekord are decreased germination season length.

**Conclusion**

The survey of changing trend of germination season with 5° and 10°c shows that most of the changes were suddenly and limited number of it had slow trend. For example the ending germination season in Shiraz station with threshold 10° and the ending of germination season in Yazd with 5°c are slow trend. The changes between series with 10°c have better frequency and order to threshold 5°c. Also the directions of changes between 2 thresholds are the same. For example the onset of germination season with 5° and 10° has the decreased trend in Tehran, and the ending germination season in both of them has the increased trend. Among germination season changes with 5° and 10°c the changes in Khoramabad, Sharekord, oroomye and Saghez are noticeable. In four stations the changes trend is opposite of changes direction in other stations, and germination season length is get shorter in these stations. While the results of other stations show that the germination season lengths get longer. The increase of germination season is obviously influenced on plants life. The studies show that the frequency of germination season changes in the west south, west and east north is more in Iran, but in central station, east and north is less than others. one of the reason is, the lack of stations in east of Iran with long term statistics for doing this research .the results of growing season length zoning based on thermal thresholds 5° and 10°c in Iran show that onset of 5° and 10°c in the southern of country, the starting of growing season is earlier and in the western and western north is later. Northern areas have earlier starting because of humidity and high temperature to western areas. In zoning of the ending date in 5° and 10°c in the western area the ending of growing season because of earlier decrease of weather temperature is faster than other areas, and the ending of growing season is later in the southern and northern of country. In the study of growing season length is determined that growing season length is
decrease from southern area to western and western north. The growing season length in thermal bases 5° and 10°c can be classified into 5 groups. Generally the understanding of length and starting and ending time of growing season of plants in thermal bases 5° and 10°c can be help to plan for farming in cultivation and harvest of crops and choosing of species that are adaptable to thermal bases and area conditions.

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