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Research Article

Effect of supplemental irrigation timing and potassium fertilizer on rain-fed fig in micro-catchment: yield and yield quality

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ABSTRACT- In this study, the effect of supplemental irrigation timing (treatments included no supplemental irrigation; supplemental irrigation in middle of March; supplemental irrigation in early May; supplemental irrigation in early August; and two supplemental irrigation events in middle of March and early May) and potassium (K) application (treatments included no-fertilizer; 150 and 250 g fertilizer per tree applied by fertigation method and no-fertilizer; 1.5 and 3.0 kg fertilizer per 1000 L water used by foliar application) on yield and yield quality of rain-fed fig trees were studied at the Estahban fig orchards in Fars province, Iran, through a three-year experiment. Results showed that supplemental irrigation for fig resulted in an increase in yield and fruit size, and improved the fruit peel color. However, it decreased total soluble solid of fruit. For one irrigation during the growing season, irrigation in late winter (March) with 1250 L of applied water per tree was better than irrigation in spring (May) with a similar amount applied water which was used as the supplemental irrigation of rain-fed fig trees under severe drought conditions. Two irrigation in March and May with 1500 L and 1250 L of applied water per tree for each event for the first year and two subsequent years, respectively, was more effective on the yield and fruit quality than single irrigation due to higher applied irrigation water. Using 150 g K per tree by fertigation method or 3.0 kg/1000L foliar K fertilizer resulted in significant effect on the yield and yield quality of fig and improved them.

INTRODUCTION

Iran is one of the most important producers of fig with an annual net production of nearly 55,000 tons, from which more than 50% is dried fig for export. Fars province is naturally suited for fig cultivation and is especially known as the dried figs producer, with an annual production of 29,000 tons in the year 2009. Traditionally, about 98% of fig trees in the Fars belong to “Sabz Estahban”, a Smyrna type cultivar possessing high dried fig quality cultivated in Estahban. Results of a study that was conducted in this region by Zare et al. (2009) showed that 50% reduction in the yield and farmers' income in the damaged rain-fed orchards of Estahban is due to drought (Jafari et al., 2012). Fig trees tolerate drier conditions than most fruit trees and are attractive fruit crops for arid zones, probably due to their very extensive and wide-ranging root systems. Fig trees are stressed in drought periods because of their shallow root systems. However, there is little information about water requirements under these conditions (Flaishman et al., 2008). Fig orchards income is mainly dependent on the amount of product and its quality. There are many parameters that affect fruit quality.

Irrigation and nutrient are two most important factors in fruit production. Water stress decreases the yield and quality of fruit as reported by Chititivaichellvan et al. (1987) for grapevine, Miller et al. (1998) for Kiwifruit, Sotiropoulos et al. (2010) for clingstone peach, and Tapia et al. (2003) for fig. The growth of fruit was mainly dependent on cell expansion that affected by cell water conditions (Yakushiji et al., 1996). Supplemental irrigation can diminish the effect of water stress on fruit yield and yield quality of rain-fed trees in drought conditions. Solute accumulation is a recognized physiological response to water stress, and has been demonstrated for a number of fruit crops including peach, cherry, strawberry, apple and orange (Miller et al., 1998; Hockema and Etxeberria, 2001). Solute accumulation can act as an osmo-protectant within the tissues of plants that are faced to water and other stresses (Miller et al., 1998; Hockema and Etxeberria, 2001; Yakushiji et al., 1996; Barry et al., 2004; Crisosto et al., 1994). During osmoregulation under water stress, cells must rely on accumulated solutes to lower osmotic potentials of cells faster than a decrease in water potential of the surrounding environment to prevent a decrease in cell volume due to dehydration (Yakushiji et al., 1996).

Potassium (K) ion has an essential role in drought tolerance for many plants through its effect on photosynthesis, osmoregulation during cell expansion, stomatal movements, solute transport in the phloem, electrical neutralization, regulation of membrane potential, oxidative phosphorylation, and the maintenance of cation-anion balance in the cytosol as well as in the vacuole (Maser et al., 2002; Pasquini and Santiago, 2012; Premachandra et al., 1991). An adequate K status may facilitate osmotic adjustment, which maintains higher turgor pressure, relative water content and lower osmotic potential, thus improving the ability of plants to tolerate drought stress (Wang et al., 2013; Mengel and Arneke, 1982). Adequate levels of K nutrition enhanced plant drought resistance, water relations, water use efficiency (WUE) and plant growth under drought conditions (Tomemori et al, 2002; Wang et al., 2013). Therefore, K addition has the potential to increase drought tolerant in plant. Furthermore, many studies showed that potassium fertilizer influenced on the yield, and fruit quality of trees (Taha et al., 2014; Khoogar et al., 2013, Aksoy and Anac, 1993; Irget et al., 1999). Application of nitrogen, phosphorus and potassium accompanied with foliar application of iron sulphate, manganese sulphate and zinc sulphate on fig orchards in Estahban improved fruit quality (Khoogar et al., 2013).

The major studies about fig trees under water stress had been focused on fig trees responses to amount of applied supplemental irrigation water. However, effect of supplemental irrigation timing on fig has not been investigated thoroughly. In this investigation, effect of supplemental irrigation timing and potassium fertilizer on yield and yield quality of rain-fed fig trees in micro-catchment system was studied.

MATERIALS AND METHODS

Field Experiment

This experiment was conducted at the Estahban rain-fed fig orchards in Fars province, I. R. of Iran, in 2010, 2011 and 2012. Some weather data of experimental location are shown in Fig. 1. Total amount of rainfall was 103.2, 260.8 and 247.9 mm for three years, respectively; whereas, the long-term mean annual rainfall in the study area is 320 mm.

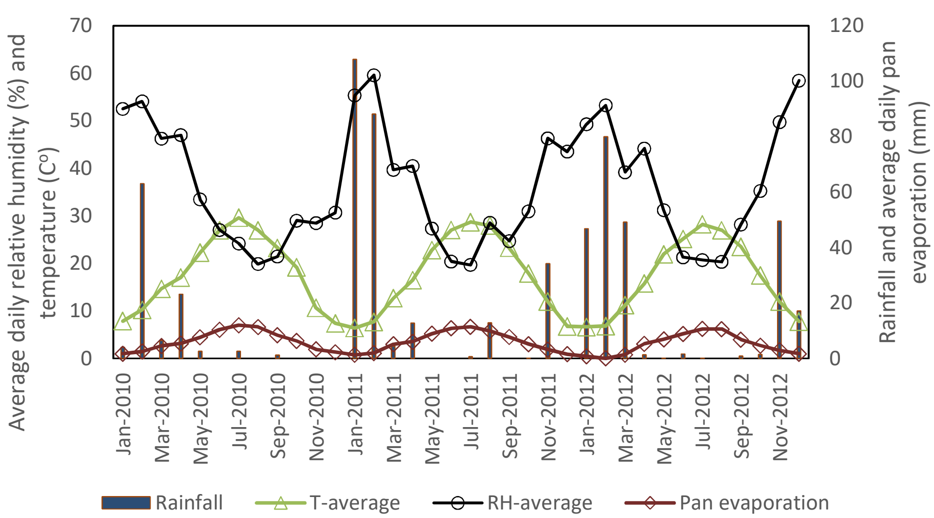

Fig. 1. Some weather data of experiment location

In the second and third years, experimental orchard was different and it was located at a distance of 500 meters from the first year orchard with similar physical and chemical properties of soil and water. Mean trees age in the orchard of the first year and subsequent two years orchard were 40 and 43 years old, respectively, in them a native cultivar of fig 'Sabz Estahban' had been planted. Distance between trees in these orchards was 10 m × 10 m. For both orchards, the experimental soils were gravely with moderate texture (clay loam), non-saline (EC= 0.43 and 0.34 dS m^{-1} for two orchards, respectively), moderately alkaline in reaction (pH of 8.15 and 8.31 for two orchards, respectively), and low in K^+ (275 ppm for both orchards). Mean soil gravel content for both orchards was 35% (v/v). The field capacity, permanent wilting point water content and bulk density for fine soil of both orchards were about 0.31 cm^3 cm^{-3}, 0.15 cm^3 cm^{-3} and 1.3 g cm^{-3}, respectively.

The experiments were set up in complete randomized block designs, each with two experimental factors included time of supplemental irrigation and different levels of potassium fertilizer with three replications. Potassium (K) was applied from hortisul source and in two application methods by either fertigation or foliar application. In fact, fig trees divided to two sets that each application method of K was used for each set. Therefore, there were two independent experiments in this study. Dates of conducted gardening practices are shown in Table 1. Surface plowing was carried out for soil aeration, weeds control, increasing the water infiltration and pest control.

Irrigation treatments included no supplemental irrigation (rain-fed treatment); one supplemental irrigation event in middle of March with 1500 L and 1250 L of applied water per tree for the first year and two subsequent years, respectively; when trees were still in dormancy, one supplemental irrigation event in early May with 1500 L and 1250 L of applied water per tree for the first year and two subsequent years, respectively; one supplemental irrigation event in early August with 1500 and 1250 L of applied water per tree for the first year and two subsequent years, respectively; and two supplemental irrigation events in middle of March and early May with 1500 L and 1250 L of applied water per tree for each event for the first year and two subsequent years, respectively. The potassium fertilizer treatments for fertigation method included no-fertilizer; 150 and 250 gram fertilizer per tree and for foliar application included no-fertilizer; 1.5 and 3.0 kg fertilizer per 1000 L water. Foliar fertilizer was used for each tree such that the area of all leaves was wet by fertilizer solution. Foliar application was conducted in May in three years of experiments so all fully expanded leaves received potassium fertilizer. Foliar K application was not used for supplemental irrigation in early August treatment since it was too late for K fertilizer application at that time and to prevent the fruit being impregnated with fertilizer.

After harvest, fruit weight per tree, total soluble solid of fruit by using a refractometer and fruit sorting were determined. Fruit sorting was carried out by sieving for three size categories included small (less than 17 mm), medium (between 17 and 22 mm) and large (greater than 22 mm). The color of fruit peel is important in figs marketing and its price. So, this property was determined by color catalog base on three colors included yellowish-white (best), light brown (medium) and dark brown (worst).

Table 1. Dates of conducted gardening practices

	Year		
Practice	First	Second	Third
Cleaning and fixing the basin for each tree	12/24/2009	1/4/2010	1/7/2012
Weeds removing	3/24/2010, 5/9/2010	3/24/2011, 5/15/2011	3/26/2012, 5/11/2012
Plowing around of trees	3/31/2010	4/3/2011	3/29/2012
Pest control	5/16/2010, 8/11/2010	5/25/2011, 7/21/2011	5/21/2012, 7/12/2012
Manual pollination	6/2/2010, 6/17/2010	6/3/2011, 6/16/2011	6/4/2012, 6/15/2012
Fruit harvest	8/25/2010-9/29/2010	8/26/2011- 9/30/2011	8/23/2012-10/1/2012

Statistical Analysis

The interaction effects between supplemental irrigation timing and potassium fertilizer were evaluated by using analysis of variance test and means were compared by using Duncan multiple range test using MSTATC software.

Results and Discussion

Results in the second and third years were separated from those of first year due to different conditions of trees and soils. For the second and third years, the effect of year on the measured traits was not considered when there was no significant interaction effect between years in analysis of variance. Therefore, in this case, mean values of traits for two years (second and third years) in different treatments were compared. Otherwise, the effect of years was considered and comparison between the means of two years (second and third years) was carried out. In this study, since there was no significant interaction effect between the supplemental irrigation (I) and potassium fertilizer levels (F) [(I×F)] on the parameters, the main effect of fertilizer application and irrigation treatments was concluded, Individually.

Yield

In three years of experiments, supplemental irrigation and application of potassium fertilizer increased fig yield (Table 2). In the first year, there was a significant difference between the effects of supplemental irrigation and rain-fed on yield.

Table 2. Mean yield (kg/tree) in different irrigation and fertilizer levels in different years

Irrigation treatment	First year							
	Foliar K fertilizer (kg/1000 L)				K application by fertigation (g/tree)			
	0	1.5	3.0	Mean	0	150	250	Mean
Rain-fed	6.75a*	6.90a	7.86a	7.18C	6.75a*	6.92a	7.89a	7.19C
March	9.62a	9.98a	12.32a	10.64AB	9.62a	11.33a	11.87a	10.94AB
May	8.71a	10.38a	11.27a	10.12B	8.71a	11.55a	10.26a	10.16B
August	----	-----	----	----	9.41a	11.26a	12.34a	11.00AB
March and May	10.42a	10.84a	13.58a	11.61A	10.42a	11.91a	13.17a	11.84A
Mean	8.88B	9.53B	11.26A		8.98B	10.60A	11.11A	
	Second and third year							
Rain-fed	4.36f	9.28bc	6.51de	6.72B	4.358g	7.22c-f	9.45ab	7.01C
March	7.06cd	7.15cd	9.50b	7.91AB	7.06d-f	8.217b-e	8.29d-e	7.86BC
May	4.89ef	7.99b-d	7.19cd	6.69B	4.89g	5.77fg	6.91ef	5.85D
August	-----	-----	-----	-----	7.81b-f	9.10a-d	9.24a-c	8.72AB
March and May	7.96b-d	6.70de	12.52a	9.06A	7.96d-e	10.68a	8.51d-e	9.05A
Mean	6.07C	7.78B	8.93A		6.42B	8.20A	8.48A	

*Means followed by the same letters in each columns and each row are not significantly different at 5% level of probability by Duncan multiple range test.

Single supplemental irrigation along with foliar K fertilizer application, and irrigation in March and in May resulted in higher yield by 48.2 and 40.9%, respectively, compared with the rain-fed yield. These enhancements in yield were 52.2, 41.3 and 53.0%, higher than the yield of rain-fed treatment for irrigation treatments in March, May and August, respectively, when K was applied by fertigation method. For two irrigation events (March +May) compared with rain-fed, yield increased by 61.7 and 64.7% for foliar and fertigated K application, respectively, due to higher applied water. Potassium fertilizer resulted in significant increase in yield for both application methods compared with no-fertilizer treatment. Similar results have been reported by Khoogar et al. (2013), Aksoy and Anac (1993) and Irget et al. (1999). In the first year, 3.0 kg/1000L foliar K fertilizer and 150 g/tree K fertilizer in fertigation method resulted in significant difference and higher yield by 26.8 and 20.0%, respectively, compared with no-fertilizer treatment. Maximum yield was obtained in two irrigation events (March +May) along with 3.0 kg foliar K fertilizer per 1000 L water and 250 g K per tree in application by fertigation method in the first year.

In the second and third years, there was significant difference in yield between the effects of two supplemental irrigation events in March and May and rain-fed along with different foliar K fertilizer levels. In K fertigation treatments, with exception of irrigation in March, supplemental irrigation treatments showed significant effect on yield. For single supplemental irrigation in different levels of K application by fertigation method, irrigation in March and August resulted in higher yield by 12.1% and 24.4%, respectively, compared with rain-fed. Irrigation in May resulted in decreasing of yield in both fertilizer application methods in comparison with rain-fed treatment. In two irrigation events compared with rain-fed, due to higher applied water, yield increased by 34.8% and 29.1% for foliar and fertigated K fertilizer, respectively. Similar to the first year, potassium fertilizer resulted in significant increase in yield for both application methods compared with no-fertilizer treatment in the second and third years. In the second and third years, 1.5 and 3.0 kg/1000L foliar K fertilizer application caused significant difference in yield by 28.2 and 47.1%, respectively, compared with no-fertilizer treatment. For application of 150 g/tree K by fertigation method the enhancement in yield was 32.1% compared with no-fertilizer treatment.

Maximum yield was observed in two irrigation events (March +May) when 3.0 kg per 1000 L of foliar K fertilizer and 150 g of K per tree were applied by fertigation method in the second and third years. There was significant interaction effect between supplemental irrigation (I), potassium fertilizer levels (F), [(I×F)] on yield for the second and third years. However, there was no significant interaction effect on yield in the first year. Irrigation in August showed the highest effect on fig yield among all of the single supplemental irrigation treatments. This effect may be due to the fact that time of irrigation was close to the fruit ripening in this treatment compared with other treatments. Yield in the first year was higher than those in the second and third years. This may be due to variation in soil and tree conditions and higher applied water.

Yield Quality

Total Soluble Solid in Fruit

There was significant difference in total soluble solids (TSS) in fruit between irrigation treatments and rain-fed in three years experiment (Table 3). As reported by Miller et al. (1998), and Hockema and Etxeberria (2001), in water stress conditions, due to osmotic adjustment, TSS in fruit in plants usually increased. Therefore, supplemental irrigation decreased the TSS in fruit. In the second and third year, TSS in fruit was statistically different for double irrigation events

(March+May) compared with single irrigation. However, there was no significant difference between the effect of double irrigation and single irrigation on TSS in the first year. Among the single irrigation treatments, irrigation in August showed minimum TSS due to simultaneity between the irrigation event and soluble solid formation in the fruit. This is concluded in previous section.

Increasing in potassium fertilizer application increased TSS in fruits in three years experiment; however, there was significant difference between the effects of different fertilizer levels and no-fertilizer treatment only for the first year. With exception of fertigated K fertilizer for the second and third years, there was significant interaction effect between the supplemental irrigation (I), and potassium fertilizer levels (F), [(I×F)] on TSS. Maximum TSS was observed in rain-fed treatment when 3.0 kg per 1000 L for foliar K fertilizer and 250 g per tree for fertigated K fertilizer in second and third years were used.

Fruit Peel Color

Results of fruit sorting based on peel color are shown in Table 4. Figs were sorted into three peel color categories including yellowish-white (the best category), light-brown (medium category) and dark-brown (the worst category). Results showed that rain-fed treatment resulted in lowest percentage of yellowish-white fruit (18.5%) and highest percentage of dark-brown (35.2%). In supplemental irrigation treatments, irrigation improved the fruit quality and marketability.

Table 3. Mean total soluble solid (%) in different irrigation and fertilizer levels in different years.

Irrigation treatment	First year							
	Foliar K fertilizer (kg/1000 L)				K application by fertigation (g/tree)			
	0	1.5	3.0	Mean	0	150	250	Mean
Rain-fed	19.0ab*	20.3a	19.7ab	19.7A	19.0a*	19.0a	17.0a-c	18.3A
March	17.0b-d	17.7a-d	17.3b-d	17.3B	17.0a-c	18.3ab	18.0ab	17.8AB
May	16.0cd	17.7a-d	19.3ab	17.7B	17.0a-c	17.0a-c	18.7ab	17.6AB
August	----	-----	----	----	16.3bc	17.0a-c	17.0a-c	16.8B
March and May	15.3d	18.7a-c	17.7a-d	17.2B	15.3c	17.7a-c	16.3bc	16.4B
Mean	16.8B	18.6A	18.5A		16.9A	17.8A	17.4A	
	Second and third year							
Rain-fed	18.2a-c	18.3a-c	20.7a	19.1A	18.2a	20.5a	20.8a	19.8A
March	17.8bc	19.3ab	19.5ab	18.9A	17.8a	18.2a	17.5a	17.8B
May	19.5ab	16.7c	17.5bc	17.9A	19.5a	17.3a	18.3a	18.4B
August	-----	-----	-----	-----	16.0a	16.5a	16.5a	16.3C
March and May	15.8c	17.7bc	15.8c	16.4B	15.8a	14.2a	14.0a	14.7D
Mean	17.8A	18.0A	18.4A		17.5A	17.3A	17.4A	

*Mean followed by the same letters in each column and each rows are not significantly different at 5% level of probability by Duncan multiple range test.

Table 4. Three-year mean fruit color categories (%) in different irrigation and fertilizer levels in different years.

Application method & irrigation	Peel color			
	Application rate	Yellow-white	Light-brown	Dark-brown
	0.0	24.44	44.44	31.11
Foliar K fertilizer (kg/1000 L)	1.5	31.11	48.89	20.00
	3	42.22	31.11	26.67
	0.0	27.78	36.11	36.11
K application by fertigation (g/tree)	150.0	44.44	33.33	22.22
	250.0	44.44	38.89	16.66
	Rain-fed	18.52	46.30	35.18
	March	38.89	33.33	27.78
Irrigation timing	May	37.03	37.04	25.92
	August	40.74	48.14	11.11
	March and May	44.44	35.18	20.37

Among the irrigation treatments, two irrigation events in March and May showed the highest percentage of yellowish-white fruit (44.4%) due to higher applied water. Minimum percentage of dark-brown fruit was observed in irrigation in August. However, maximum percentage of light-brown fruit was also observed in this irrigation.

Farmers believe that irrigation in summer usually resulted in production of black fruits. However, based on findings of this investigation, this belief cannot be accepted as the minimum percentage (11.1%) of dark-brown fruits was observed in summer irrigation treatment in this study. On the other hand, maximum percentage (48.1%) of light-brown fruits was also observed in this treatment.

In both potassium fertilizer application methods, potassium improved the fruit peel color quality in comparison with no fertilizer treatment and resulted in higher fruit marketability. Similar results have been reported by Khoogar et al. (2013). Minimum percentage of yellowish-white fruits and maximum percentage of dark-brown fruits were observed in no fertilizer treatment in both potassium fertilizer application methods. In terms of fruit peel color, best fruit was obtained in maximum level of potassium fertilizer application. Application of 250 g/tree K fertilizer by fertigation method and 3.0 kg/1000 L foliar K fertilizer application resulted in maximum percentage of yellowish-white fruits.

Fruit Size

Results of fruit sorting based on size are shown in Table 5. Results showed that most of the fig fruits were small in rain-fed treatment and their size were smaller than 17 mm. Supplemental irrigation events increased the fruit size. Irrigation in August resulted in maximum percentage of large fruits even higher than those in two irrigation events in March and May in which higher amount of water was applied. This difference may be due to irrigation time coincided with the fruit ripening time in this treatment compared with other treatments. Results showed that irrigation in March resulted in larger fruits in comparison with irrigation in May.

In both potassium fertilizer application methods, increasing in amount of applied potassium resulted in fruit size improvement in comparison with no fertilizer treatment. Minimum percentage of large fruits and maximum percentage of small fruits were observed in no fertilizer treatment in both potassium fertilizer application methods. In terms of fruit size, large fruits were obtained in maximum level of potassium fertilizer application.

Application of 250 g/tree K fertilizer by fertigation and 3.0 kg/1000 L foliar K fertilizer resulted in maximum percentage of large fruit size. Generally, in all potassium fertilizer levels for both application methods, percentage of small size fruits were higher than other two sizes. Potassium application only decreased the percentage of small size fruits and increased the percentage of large size fruits. This may be due to the characteristics of the fig cultivar under study or water stress intensity or climatic conditions.

Table 5. Three-year mean fruit percentage in different size (%) in different irrigation and fertilizer levels.

Application method & irrigation		Size		
	Application rate	Small	Medium	Large
Foliar K fertilizer (kg/1000 L)	0.0	44.27	36.98	18.75
	1.5	37.91	38.30	23.78
	3	39.26	32.76	27.98
K application by ertigation (g/tree)	0.0	42.58	36.24	21.18
	150.0	38.12	38.36	23.52
	250.0	37.44	36.79	25.76
Irrigation timing	Rain-fed	59.50	30.03	10.46
	March	33.67	41.00	25.33
	May	40.49	35.82	23.69
	August	29.29	35.40	35.31
	March and May	31.11	40.30	28.59

CONCLUSIONS

Supplemental irrigation application in fig orchards resulted in increasing yield and fruit size and improved the fruit peel color. However, it decreased total soluble solid of fruit. With regard to fruit quality, irrigation in August showed positive effect on yield and fruit size and negative effect on total soluble solid and peel color of fruits. Therefore, choosing this time for supplemental irrigation depends on variation in fig price in market that depends on fruit size and color and it needs economic analysis. Two times irrigation events (March and May) were more effective on yield and fruit quality than single irrigation event due to higher applied irrigation water. Therefore, supplemental irrigation can also be used to save the rain-fed fig trees under severe drought conditions along with producing economic yield. However, it is important that supplemental irrigation under normal rainfall occurrence should not be practiced. Potassium fertilizer also showed significant effect on yield and yield quality of fig and improved them. In general, 250 g of K application per tree by fertigation method and 1.5 kg/1000 L foliar K fertilizer can be used for fertilization of the fig trees along with supplemental irrigation under drought conditions.

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اثر زمان آبیاری تکمیلی و کود پتاسیم بر انجیر دیم کشت شده در ریز حوزه: عملکرد و کیفیت عملکرد

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درخت انجیر
کود پتاسیم
زمان آبیاری تکمیلی
عملکرد
کیفیت عملکرد

چکیده- در این مطالعه، اثر زمان آبیاری تکمیلی (تیمار ها شامل بدون آبیاری تکمیلی، آبیاری تکمیلی در اسفند، آبیاری تکمیلی در اردیبهشت، آبیاری تکمیلی در مرداد و دو آبیاری در اسفند و اردیبهشت) و کود پتاسیم بصورت کود آبیاری (تیمار ها شامل بدون کود، کود پتاسیم به میزان ۱۵۰ و ۲۵۰ گرم به ازای هر درخت) و محلول پاشی (تیمار ها شامل بدون محلول پاشی، مقدار ۱/۵ کیلوگرم کود در هر ۱۰۰۰ لیتر آب و مقدار ۳ کیلوگرم کود در هر ۱۰۰۰ لیتر آب) بر عملکرد و کیفیت عملکرد انجیر دیم در یک آزمایش سه ساله مطالعه شد. نتایج نشان داد که آبیاری تکمیلی انجیر منجر به افزایش عملکرد و اندازه میوه و بهبود رنگ پوست میوه گردید. هرچند آبیاری تکمیلی کل مواد جامد محلول میوه را کاهش داد. برای یک آبیاری در طول دوره رشد، آبیاری در اواخر زمستان به مقدار ۱۲۵۰ لیتر آب به ازای هر درخت نسبت به آبیاری با همین مقدار در بهار در شرایط تنش خشکسالی نتایج بهتری داشت. انجام دو آبیاری در اسفند و اردیبهشت به مقدار به ترتیب ۱۵۰۰ و ۱۲۵۰ لیتر بازای هر درخت در سال اول و سالهای دوم و سوم به ترتیب بر عملکرد و کیفیت میوه موثر تر از تک آبیاری بوده که بدلیل مقدار بیشتر آب آبیاری بوده است. کاربرد ۱۵۰ گرم کود پتاسیم بازای هر درخت بصورت کود آبیاری و یا محلول پاشی برگ به میزان ۳ کیلوگرم بر ۱۰۰۰ لیتر اثر معنی داری بر عملکرد و کیفیت عملکرد انجیر داشت.