DOMATES BİTKİSİNİN MİNERAL BESLENMESİ VE MEYVE KALİTESİ

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ÖNSÖZ

Değişen yaşam şartları, teknolojik gelişmeler ve son dönemde yaşanan salgın süreci özellikle işlenmiş gıda ürünleri tüketimini arttırmıştır. Artan talebe paralel olarak, bilinçlenen tüketiciler, tükettikleri gıdalarda tat, âroma, renk, görünüş, gibi özelliklerin yanı sıra, gıdanın sağlığa olan etkilerini de daha fazla önemsemektedirler. Sağlıklı gıdaya giderek artan talep, aynı zamanda üreticileri de güvenilir ve kaliteli ürün yetiştirme konusunda teşvik etmektedir. Sürdürülebilir ve kaliteli üretimin temelini de bitkilerde doğru beslenme oluşturmaktadır.

Yaşamın en önemli yönlerinden biri, canlı hücrenin çevreden birtakım maddeleri alması ve bunları kendi hücresel bileşenleri veya organlarının yapımı için enerji kaynağı olarak kullanmak üzere sentezlemesidir. Büyüme ve gelişmenin yanı sıra metabolizma için ihtiyaç duyulan kimyasal bileşiklerin sentezlenmesi ve bunların organizmaya alınması ‘’beslenme” olarak tanımlanır. Bitkiler âleminde sağlıklı bir hayat döngüsü için besin elementlerine ihtiyaç vardır. Bitki besin elementleri makro (C, H, O, N, P, K, Ca, Mg, S), mikro (Fe, Cu, Zn, Mn, B, Mo) ve fonksiyonel (Si, Na, Co, Ni, Se, Al, V) elementler olarak sınıflandırılmaktadır. Bitkiler, makro besin elementlerine mikro besin elementlerinden daha fazla ihtiyaç duyarlar. İyonik formda veya organik moleküllerin yapısında bulunan mineral elementlerin bitkilerde önemli fizyolojik görevleri vardır. Bitkilerde bulunan mineral elementlerin miktar ve çeşitleri ile yetiştirme ortamında bulunan elementlerin miktar ve çeşitleri arasında yakından ilişkilidir. Vejetasyonu kısa olan sebzelerde beslenmenin önemi daha da artmaktadır.

Ülkemiz tarım sektöründe önemli bir yeri bulunan domates, tüketim şeklinin çeşitliliği nedeniyle de artan bir talebe sahiptir. *Solanaceae* familyasında yer alan domates (*Lycopersicon esculentum* Mill.) açıkta yetiştirildiği gibi örtüaltında da en fazla üretilen sebzelerdendir. Bu nedenle tüm yıl boyunca üretimi devam etmektedir. Yetiştirme süreci pek çok sebzeye göre daha uzun olduğundan yetiştirildiği ortamın kalitesi önemlidir. Bitkiye sağlanan besin elementlerinin miktarı ve türü hem verimini, hem de meyvenin besin içeriğini, tadını ve hasat sonrası depolama kalitesini etkilemektedir.

Yetiştirme ortamına bitkinin ihtiyaç duyduğundan daha fazla miktarda besin maddesi uygulaması domates verimini azaltabilir. Ayrıca, aşırı gübre kullanımı, gübreleme maliyetini artmasına ve çevre kalitesinin bozulmasına neden olabilir. Bu yüzden, domates verimini olumsuz yönde etkilemeyecek ve aynı zamanda gübreleme maliyetini ve çevresel bozulmayı mümkün olduğu kadar azaltan makul ve sürdürülebilir bir gübreleme programının uygulanması gerekmektedir.

Diğer birçok meyve ve sebzede olduğu gibi domatesin de bileşiminin büyük bir çoğunluğunu su oluşturmaktadır. Domatesin sofralık (iri tip, cherry vb.) ve sanayi tipi çeşitlerinin bileşimi; uygulanan kültürel işlemler, yetiştirme ortamı (tarla, sera), iklim, hasat zamanı gibi faktörlere göre değişkenlik gösterebilmektedir. Domatesin bileşiminde yer alan kuru maddenin önemli bir kısmını glikoz ve fruktoz temelli karbonhidratlar oluştururken; protein ve yağ oranı ise karbonhidratlara kıyasla oldukça düşüktür. Domates; askorbik asit, niasin, K1 vitamini, folat gibi bazı vitaminler ile başta potasyum olmak üzere bazı mineral maddeler ve karotenoidler gibi önemli fonksiyonel özelliklere sahip olan likopen açısından da oldukça önemli bir kaynaktır. Ayrıca, domatesin yüksek likopen içerikleri sebebiyle bazı kanser tiplerine, kalp damar hastalıklarına ve Alzheimer gibi hastalıklara karşı koruyucu etkisi de bulunmaktadır.

Bilimsel kaynak ve rehber niteliğinde hazırlanan bu kitapta domates bitkisinin mineral beslenme stratejileri ve etkileşim dinamikleri sürdürülebilir bir yönetim anlayışı içerisinde işlenmiştir.

Bu kitabın, domates üretimi ile ilgilenen tüm sektör ve çalışanlarının yanı sıra, tarım teşkilatı çalışanlarına, Ziraat ve Gıda Mühendisliği'nde okuyan öğrencilere ve araştırmacılara faydalı olması dileğiyle…

Yazarlar
Aralık-2021

İÇİNDEKİLER

Karşılaştırmalı Üstünlük Teorisi'ne göre, bir ülke ticaret ortaklarına göre nispi olarak ucuza (daha düşük birim emek maliyetle) üretebildiği malları ihraç etmeli, nispi olarak pahalıya (daha yüksek birim emek maliyetle) üretebildiklerini de ithal etmelidir (Hajiyev, 2004). Türkiye'nin sebzecilikte bazı alt grupların ihracatında küresel piyasalarda önemli bir karşılaştırmalı üstünlüğe sahip olduğu belirlenmiştir. Ancak, sebze alt gruplarının büyük çoğunluğunun ihracatında karşılaştırmalı üstünlük olmasına rağmen, son yıllardaki üstünlüklerde nispi olarak azalma da söz konusudur (Erkan ve ark., 2015). Bununla birlikte, domateste "göreli ihracat avantajı indeksi" 2010 yılına göre azda olsa azalsa da hale yüksek bir seviyededir (Çizelge 1.4). ''Göreli ihracat avantajı indeksi" belirli bir üründe bir ülkenin dünya piyasalarında sahip olduğu ihracat payının diğer bütün mallarda dünya ihracatında sahip olduğu paya oranı olarak tanımlanabilir (Bashimov, 2016). Üretimin miktarı ve yeterlilik oranı yüksek olan domatesin dış ticarette değerlendirilmesi önem arz etmektedir. Diğer yandan, domatesin dış ticarette yeri incelenirken rekabet gücünün ne olduğunun bilinmesi başarı şansını artıracaktır (Güvenç, 2019).

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sıralı kasalar tercih edilmelidir. Domateslerde çok sıralı kasalar zorunlu olmadıkça kullanılmamalıdır (Anonim, 2006).

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Çizelge 4.11. Domateste değişik zamanlarda alınan yaprak örneklerinin mikro element analiz sonuçlarının yorumlanması (Hochmuth ve ark. 2012).

Örnekleme zamanı	Beslenme durumu	Fe (ppm)	Mn (ppm)	Zn (ppm)	B (ppm)	Cu (ppm)	Mo (ppm)
5 yapraklı Dönem	Noksan	< 40	< 30	< 25	< 20	<5	< 0.2
	Yeterli	40-100	30-100	25-40	20-40	5-15	0.2-0.6
	Yüksek	>100	>100	> 40	> 40	>15	> 0.6
İlk çiçeklenme	Noksan	< 40	<30	< 25	< 20	<5	< 0.2
	Yeterli	40-100	30-100	25-40	20-40	5-15	0.2-0.6
	Yüksek	>100	>100	> 40	> 40	>15	> 0.6
İlk meyve tutumu	Noksan	< 40	<30	< 20	< 20	<5	< 0.2
	Yeterli	40-100	30-100	20-40	20-40	5-10	0.2-0.6
	Yüksek	>100	>100	> 40	> 40	>10	> 0.6
Meyvede ilk olgunlaşma	Noksan	< 40	< 30	< 20	< 20	<0.5	< 0.2
	Yeterli	40-100	30-100	20-40	20-40	5-10	0.2-0.6
	Yüksek	>100	>100	> 40	> 40	>10	> 0.6
Hasat zamanı	Noksan	< 40	< 30	< 20	< 20	<5	< 0.2
	Yeterli	40-100	30-100	20-40	20-40	5-10	0.2-0.6
	Yüksek	>100	>100	> 40	> 40	>10	> 0.6

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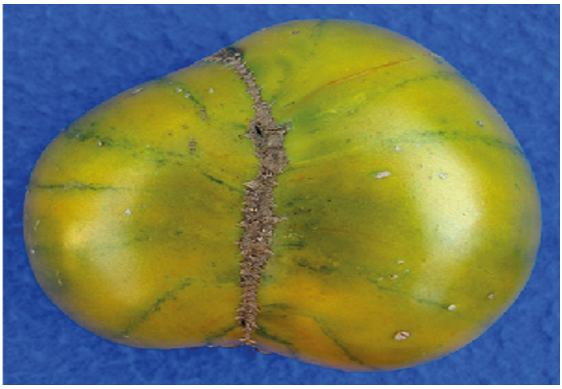

Şekil. 5.12. Domates meyvesinde yara izi
(Kaynak linki: https://blogs.cornell.edu/livegpath/gallery/tomato/zippering-fruit-disorder-on-tomatoes/)

Korunma Yolları: Bu bozukluğu kontrol altına almanın tek yolu, soğuğa dayanıklı, yara iznine yatkın olmayan domates çeşitlerini yetiştirmektir. Çiçeklenme ve meyve tutumu zamanında serada çevresel koşulların ideal düzeyde tutulması sağlanmalıdır. Sera içerisinde düşük sıcaklıklarından kaçınılması gerekir.

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Tuzluluk ile mikro elementler arasındaki ilişkilerin ise kompleks olduğu ifade edilmiştir. Tuzluluk düzeylerine ve gelişme ortamının kompozisyonuna bağlı olarak tuzluluğun bitkide mikro element konsantrasyonunu artırdığı, azalttığı ya da hiç etkilemediği bildirilmiştir (Grattan ve Grieve, 1999). Örneğin, domates bitkisinde yapılan bazı araştırmalar, tuzluluğun yaprakta Mn kapsamını azaltığını öne sürerken; diğer bazı çalışmalar ise tuzluluğun yaprakta Mn kapsamını arttırdığını ya da hiç etkilemediğini rapor etmiştir. Zn uygulamalarının tuz stresine maruz kalmış domates bitkilerinde gelişmeyi iyileştirdiği bildirilmiştir (El-Sherif ve ark., 1990). Bazı çalışmalarda ise tuzluluğun domates sürgünlerinde Zn, Fe ve Cu konsantrasyonunu arttırdığı belirtilmiştir (Grattan ve Grieve, 1999; Knight ve ark., 1992; Maas ve ark., 1972; Niazi ve Ahmed, 1984). Substrat ortamında yüksek Ca konsantrasyonunun B absorpsiyonunu azalttığı ve B noksanlığına sebebiyet verdiği belirtilmiştir (Gupta ve ark., 1985).

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rapor edilmiştir (Sonneveld ve Van der Burg, 1991; Schwarz ve ark., 2001). Sonuç olarak, bazı durumlarda birinci sınıf meyve yüzdesi üzerine tuzluluğun uygun etkisi küçük meyvelerin ve çiçek burnu çürüklüğü görülen meyvelerin yüzde oranının artmasıyla etkisizleştiği belirtilmiştir (Chretien ve ark., 2000). Orta tuzluluğa domatesin maruz bırakılması halinde meyve kalitesi iyileşmiş, ürün azalmış fakat domates ürünündeki bu azalma diğer meyveli sebzelere göre daha az olmuştur (Savvas, 2001). Bundan dolayı, topraksız yetiştiricilikte domates bitkisinin besin çözeltisinde tavsiye edilen tuzluluk düzeyine iki zıt etkinin arasında kalarak karar verilmelidir. Domates için uygun tuzluluk düzeyi normal besin çözeltisinde 2,6 dS/m olan elektriksel iletkenlik değerini 3,5-3,7 dS/m değerlerine yükseltecek şekilde besin çözeltisine tuz ilavesiyle ayarlanması gerektiği belirtilmiştir (Sonneveld ve Straver, 1994). Bitki besin çözeltisi uygulamalarının gece boyunca yüksek EC değerinde, gündüzleri ise düşük EC değerlerinde olmasının meyve verimini etkilemeksizin domateste meyve kalitesini iyileştirdiği bildirilmiştir (Santamarina ve ark., 2004).

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Çizelge 8.7. Domateste sterol içerikleri (Yousuf Ali ve ark., 2020)		
	Konsantrasyon (mg / kg)	**Değer aralığı**
Kampesterol	147.50 ±31.13	100.00-18.00
Stigmasterol	387.50 ± 88.71	260.00-510.00
Stigmastanol	28.25 ± 10.92	10.00-38.00
β-sitosterol	720.00 ± 175.64	520.00-1000.00
Delta 5-avenasterol	62.30 ± 2.21	10.00-65.87
Koprastanol	9.70 ± 1.80	2.10-11.54
Cholest-7-en-3-ol	3.60 ± 0.13	0.42-4.40
Kolesterol	41.90 ± 2.10	8.40-43.45
Lanost-8-en-3-β-ol	52.40 ± 6.80	4.50-60.65
24-Okso-kolesterol	67.50 ± 3.20	14.20-70.69
Total	1283.25 ± 239.39	918.00-170.00

Konsantrasyonlar, standart sapmalarla (±) verilmiştir

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nünde Pb kalıntısı tespit etmişlerdir. Ancak domates meyvelerinde Pb kalıntısı bulunmamıştır. Bununla birlikte, domates meyvesinin C vitamini içeriğinin çeşitli konsantrasyonlardaki Pb kirleticilerinden etkilenmediği de araştırıcılar tarafından bildirilmiştir. Nihayetinde, Pb kontaminasyonu domates üretimi üzerinde olumsuz etkilere sahip olsa da, C vitamini içeriği üzerinde ciddi bir olumsuz etkiye sahip değildir. Öte yandan, ağır metallerle kirlenmiş topraklar üzerinde yapılan araştırmalar, sebze ve domates yetiştirilen alanların % 90'ında Cd, Cu, Cr, Pb ve Zn konsantrasyonunun Gıda ve Tarım Örgütü tarafından bildirilen ağır metal sınır değerlerinden daha yüksek olduğu bildirilmiştir. Bu durum tüketiciler için sağlık riski oluşturmaktadır (Odai ve ark., 2008).

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