Cutting Edge
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Fruit Size Management Strategies on Citrus

by
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There have been recent changes to the Recommended Usage Restrictions pertaining to Corasil E® (Dichlorprop) residue tolerances in markets, as communicated in Cutting Edge 71. This has necessitated a revision of the various citrus fruit size management strategies. An individual factor or a combination of factors may be responsible for small fruit size. All the factors influencing fruit size should be considered and managed optimally. The choice of strategy should be guided by the usage restrictions pertaining to the various target markets, as reflected in the Recommended Usage Restrictions document and its updates.

Irrigation: Stress irrigation during phase II (starting ± 60 days after full bloom) of fruit growth results in smaller fruit. Faster and more uniform fruit growth results from more frequent short cycle irrigation compared to long cycle irrigation. Irrigation should be optimal when using single drip lines, on sandy soils, and with larger than average tree size. The transpiration demand from larger trees with a bigger crop load are higher than for smaller trees with a smaller crop load and irrigation should be adapted accordingly.

Fertilization: Leaf N:K ratio is important for fruit size and should be between 1.6 and 2.2. One or two foliar applications of KNO_3 at 4% in November and/or December can improve fruit size if K-levels in leaves are below 0.9% and only if N-levels are below 2.3%. A second pre-bloom foliar application of urea can be replaced by a 4% KNO_3 foliar application where K-levels are low and fruit size is a problem. KNO_3 foliar application should not be applied in conjunction with Corasil E®/Maxim®. Avoid nitrogen fertilization after December due to its negative effect on fruit colour and rind quality.

Tree and root health: Any factor inhibiting water uptake and transport in a plant will have an adverse effect on fruit size. Tristeza, greening disease and blight can adversely affect tree health which will result in small fruit. Control of nematodes and Phytophthora, especially if it causes a lot of root damage, can improve fruit size.

Delaying harvest: Although fruit growth is very slow during phase III of fruit development, delaying harvest and selective harvest of larger fruit can result in a fruit size improvement. Delaying harvest, however, improves the possibility of the development of creasing and has an adverse effect on the floral intensity of the return bloom which can result in alternate bearing.

Summer girdling: Summer girdling in combination with some of the other control measures can have a positive effect on fruit size, but only if all the other factors that have an adverse effect on fruit size are managed optimally. It is however, a time-consuming method.

Pruning: Pruning in the winter and not later than September improves the light distribution inside the tree and improves the quality of the bearing wood inside the tree. Pruning can also be used as a thinning technique. Prune more severely after a light crop, when a heavy crop is expected. In very dense trees and especially older trees, light levels drop to below 30% in the inside of the tree and adversely affect fruit size.

Fruit load: Although there are a lot of controllable and non-controllable factors that play a role in fruit size, fruit load is a large contributing factor. The more fruit on a tree, the smaller the fruit are. With thinning we change the leaf:fruit ratio resulting in more leaves contributing to the growth of a single fruit. Crop reduction, especially in the “on-year” with the aim of reducing fruit-to-fruit competition and therefore improving fruit size can be accomplished through blossom thinning by pruning during bloom, flower reduction with gibberellin application the previous winter (not commonly used and not registered), hand thinning and chemical thinning with synthetic auxins. Fruit size improvement due to “overthinning” can sometimes result in a greater financial benefit than the crop reduction.

Hand thinning: Selective removal of 20-30% of fruit from heavily bearing trees (the small and blemished fruit are removed) within 21 days from the November/December fruit drop period can improve fruit size and the earlier this can be done after the November/December drop the greater the effect will be. This is, however, a time consuming practice.

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Synthetic auxins: Application of Corasil E® (2,4-DP, Dichlorprop) or Maxim® (3,5,6-TPA) at an early stage (smallest diameter on product label) can thin fruit (20-30% thinning) and improve fruit size. Early application results in more thinning and a better fruit size response. Later application (larger diameter on product label) can improve fruit size without thinning or with 5-10% thinning. The timing of application (small or large diameter) is determined by the fruit set achieved, e.g. where gibberellins were applied to improve fruit set, Corasil E® or Maxim® should be used, and with a very heavy set it should be applied earlier. Be careful where heat waves and water stress can cause excessive drop of small fruit. Corasil E® or Maxim® should only be used where fruit size is a problem, with a heavy crop load that will result in small fruit and where gibberellins were applied to improve fruit set. Trees should be healthy for Corasil E® or Maxim® to have the desired effect. Application of Corasil E® or Maxim® with K foliar applications in the same season, sandy soils, rough lemon rootstocks, single drip lines and high N- and K-levels, and a combination of these factors can result in granulation of fruit.

Corasil E® and Maxim® have to be applied strictly according to the product label, the warnings on the product label regarding its use should be noted, and additionally current Recommended Usage Restrictions pertaining to residue tolerances in the target markets must be adhered to.

Warnings on the labels:

1. Avoid application of potassium nitrate leaf sprays to increase fruit size in conjunction with the use of Corasil E® or Maxim® since it may cause granulation of fruit.
2. Fruit from trees on Rough lemon and Volckameriana rootstocks and/or trees planted on sandy soils have a tendency to granulate. These conditions, or their combination with very high potassium levels may cause granulation if Corasil E® or Maxim® is applied.
3. Do not apply Corasil E® or Maxim® if trees are subjected to any stress, including water stress (drought), water logging, malnutrition, nematode or pathogen stress. Drought stress may develop faster than normal when using a single drip line, on sandy soils, with especially larger trees in very hot areas. Do not spray during the heat of the day when temperatures exceed 30℃ or under low humidity conditions. Early morning, as soon as the dew has evaporated from the leaves, is the optimum time of application.
4. Do not allow the spray mix to stand for long periods or overnight before application.
5. Tank mixes of other products, especially oils, with Corasil E® or Maxim® should be avoided.

Care should be taken of the following:

1. Spray volumes/coverage of the trees should be strictly according to the label: Corasil E® and Maxim® are recommended as a medium cover spray with an even spray coverage over the entire tree.
2. Timing of application and concentration should be strictly according to the label.

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Corasil E® is registered with a withholding period of 150 days between application and harvest and is recommended at 150 ml/100 L water with a wetting agent. However, it is imperative to refer to the most recent Recommended Usage Restrictions or subsequent amendments in Cutting Edge publications, such as Cutting Edge no. 71. If the pH of the water is >6 it should be corrected to between 4.5 and 5 before Corasil E® is added.

	Cultivar	**Fruit diameter (mm)**
Oranges	Delta, Valencia, Navels	18-25
Clementines	Nules (heavy set)	8-11
	Oroval (historically small)	12-15
	SRA (heavy set)	8-10
	SRA (medium set)	10-12
	Nova (do not apply)	X
Grapefruit	Marsh, Star Ruby, Rosé	16-28
Satsumas	Owari, Miho-Wase	15-20

Maxim® is registered with a withholding period of 120 days between application and harvest and is recommended at 1 tablet/100 l water with a wetting agent. If the pH of the water is >6 it should be corrected to between 4.5 and 5 before Maxim® is added.

	Cultivar	**Diameter (mm)**
Oranges	Delta	20-24
	Valencia with seeds	16-20
	Navels	20-24
Clementines	Nules	15-18
	Oroval, Marisol (historic small)	15-18
	SRA	12-15
	Nova (do not apply)	X
Satsumas	Owari, Miho-Wase	20-24
Grapefruit	Not registered	X

Average diameter calculation to determine when Corasil E® or Maxim® should be applied can be done as follows. Select two to three representative trees per uniform block and measure the diameter of at least 50 fruit per tree. Select a part of the tree with the highest density of fruit.

Measure all the fruit from small to large, but not the yellow fruit. When the average reaches the desired fruit diameter, spray immediately. Measure fruit with a caliper, preferably a digital one.

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Vruggrootte Bestuur Strategieë vir Sitrus

deur
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Daar is onlangse veranderinge aangebring aan die Gebruiksbeperkings ("Recommended Usage Restrictions") van Corasil E® (Dichlorprop) residu toleransies in die markte, soos deurgegee in Snykant 71. Dit het die hersiening van die verskillende vruggrootte bestuur strategieë genoodsaak. Enkele faktore of 'n kombinasie van faktore mag verantwoordelik wees vir klein vrugte. Al die faktore wat vruggrootte beïnvloed moet egter in ag geneem word en optimaal bestuur word. Die keuse van die strategie moet bepaal word deur die gebruiksbeperkings bepaal deur die verskillende markte, soos aangedui word in die Gebruiksbeperking dokument en opdaterings daarvan.

Besproeiing: Stresbesproeiing tydens fase II (begin ± 60 dae na volblom) van vruggroei lei tot kleiner vrugte. Vinniger en meer uniforme vruggroei word verkry met meer gereelde kort siklus besproeiing as vergelyk word met lang siklus besproeiing. Besproeiing moet optimaal wees wanneer enkeldruplyne gebruik word, op sandgronde, en met groter as gemiddelde bome. Die transpirasiebehoefte van groter bome met 'n groter oeslading is hoër as vir kleiner bome met 'n kleiner drag en besproeiing moet aangepas word by boomgrootte.

Bemesting: N:K verhouding in blare is belangrik vir vruggrootte en moet in die orde van 1.6 tot 2.2 wees. Een of twee blaarbespuitings van KNO_3 teen 4% in November en/of Desember kan vruggrootte verbeter as K-vlakke in blare onder 0.9% is en net as N-vlakke onder 2.3% is. 'n 2de voorblom ureum spuit kan ook deur 4% KNO_3 vervang word waar kalium laag is en klein vrugte ook voorkom. KNO_3 blaarbespuiting moet nie saam met Corasil E®/Maxim® gebruik word nie. Stikstofbemesting moet na Desember vermy word as gevolg van die negatiewe effekte op vrugkleur en skilkwaliteit.

Boom- en wortelgesondheid: Enige faktor wat wateropname en vervoer in 'n plant belemmer sal vruggrootte nadelig beïnvloed. Tristeza, vergroening en skroeisiekte ("blight") kan die boomtoestand tot so 'n mate benadeel dat dit lei tot kleiner vrugte. Beheer van aalwurms en Phytophthora, veral as dit noemenswaardige wortelskade aanrig, kan vruggrootte verbeter.

Uitstel van oes: Alhoewel vrugte baie stadig groei tydens fase III van rypwording kan die uitstel van die oes en selektiewe oes van groter vrugte, vruggrootte tot 'n klein mate verbeter. Uitstel van die oes vermeerder egter die kans op die ontwikkeling van kraakskil en verminder die blomintensiteit die volgende seisoen wat tot alternatiewe drag kan lei.

Somer ringelering: Somer ringelering in kombinasie met van die ander beheerstrategieë kan 'n positiewe effek op vruggrootte hê, indien die ander faktore wat vruggrootte benadeel optimaal bestuur word. Dit is 'n baie arbeidsintensiewe praktyk.

Snoei: Snoei in die winter en nie later as September verbeter ligverspreiding binne-in die boom en verbeter die kwaliteit van die drahout binne-in die boom. Snoei kan ook as 'n uitduntegniek gebruik word. Snoei strawwer na 'n ligte oes m.a.w. as 'n swaar oes verwag word. In baie digte bome en veral ouer bome daal ligvlakke tot onder 30% in die binnekant van die boom en word vruggrootte benadeel.

Vruglading: Alhoewel daar verskeie beheerbare en nie-beheerbare faktore is wat 'n rol speel in vruggrootte is 'n groot bydraende faktor die vruglading. Hoe meer vrugte op 'n boom, hoe kleiner is die vrugte. Met uitdun verander ons die blaar:vrug verhouding sodat ons meer blare het in die boom wat bydra tot die groei van 'n enkele vrug. Oesverlaging veral in 'n "aan-jaar" met die oog om vrug-tot-vrug kompetisie te verminder en sodoende vruggrootte te verbeter kan gedoen word met blomuitdun deur te snoei in die blomtyd, blomvermindering met gibberellienspuite die vorige winter (nie algemeen gebruik nie en nie geregistreer nie), handuitdun en chemiese uitdun met sintetiese ouksiene. Vruggrootte verbetering a.g.v. "ooruitdunning" kan soms 'n groter finansiële voordeel inhou as die oesverlaging wat plaasvind.

Handuitdun: Selektiewe verwydering van 20-30% van die vrugte op bome met 'n swaar drag (die kleinste en beskadigde vruggies word verwyder) binne 21 dae vanaf die November/Desember vrugval kan vruggrootte verbeter en hoe vroeër dit gedoen kan word hoe groter is die effek. Dit is egter 'n tydrowende praktyk.

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Sintetiese ouksiene: Spuit van Corasil E® (2,4-DP, Dichlorprop) of Maxim® (3,5,6-TPA) op 'n vroeë stadium (kleinste deursnit op produk etiket) kan vrugte uitdun (20-30% uitdunning) en vruggrootte verbeter. Vroeë spuite veroorsaak meer uitdunning en 'n beter respons. Later toediening (grootste deursnit op produk etiket) kan vruggrootte verbeter sonder om uit te dun of 5-10% uitdunning. Tyd van toediening (op klein of groot vrugdeursnit) word bepaal deur set behaal, bv. waar gibberelliene gespuit is om set te verbeter moet met Corasil E® of Maxim® opgevolg word en met 'n baie hoë set sal vroeër gespuit moet word. Wees ook versigtig waar hittegolwe en waterstres veroorsaak dat vruggies afspeen. Corasil E® of Maxim® moet net gebruik word waar vruggrootte 'n probleem is, waar 'n swaar oes voorkom wat vruggrootte gaan benadeel en waar gibberelliene gebruik is om set te verbeter. Bome moet in 'n goeie toestand wees vir Corasil E® of Maxim® om die gewenste effek te hê. Toediening van Corasil E® of Maxim® saam met K-blaarbespuitings in dieselfde seisoen, sandgronde, growweskil suurlemoen onderstamme, enkel drupperlyne, en hoë N-en K-vlakke kan tot uitdroging/granulasie van die vrugte lei.

Corasil E® en Maxim® moet streng volgens die etiket aangewend word, daar moet kennis geneem word van die waarskuwings op die etiket i.t.v. die gebruik daarvan en huidige Gebruiksbeperkings rakende residu toleransies in die teikenmarkte moet streng gevolg word.

Waarskuwings op die etiket:
1. Vermy toedienings van kaliumnitraat blaarbespuitings om die vruggrootte te vergroot saam met die gebruik van Corasil E® of Maxim® omdat dit granulasie van die vrugte kan veroorsaak.
2. Vrugte van bome op growweskil suurlemoen en Volckameriana onderstamme en/of bome op sandgronde neig tot granulasie. Hierdie toestande, of gekombineerd met hoë kalium vlakke mag granulasie veroorsaak as Corasil E® of Maxim® toegedien word.
3. Moenie Corasil E® of Maxim® toedien as bome aan enige vorm van stres blootgestel is nie, insluitende water stres (droogte), nat gronde, wanvoeding, nematode of patogeenstres. Droogtestres kan vinniger ontwikkel as normaal by 'n enkeldruplyn, op sandgronde, met groter bome in baie warm areas. Moenie toedien as temperature bo 30℃ is nie, of onder lae humiditeit nie. Vroeë oggend, as die dou reeds vanaf die blare verdamp het is die optimale tyd van toediening.
4. Moenie die tenk laat staan vir lang periodes of oornag voordat dit toegedien word nie.
5. Tenkmengsels van ander produkte, spesifiek olies, saam met Corasil E® of Maxim® moet vermy word.

Die volgende moet onder die aandag gebring word:
1. Spuitvolumes/bedekking van die bome moet streng volgens die etiket gedoen word. Corasil E® en Maxim® word aanbeveel as 'n medium spuitbedekking.
2. Die tyd van toediening en die konsentrasie moet streng volgens die etiket gedoen word.

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Corasil E® is geregistreer met 'n onthoudingsperiode van 150 dae tussen toediening en oestyd en word aangewend teen 150 ml/100 l water saam met 'n benatter. Dit is egter baie belangrik om te verwys na die mees onlangste Gebruiksbeperkings of latere aanpassings in Snykant publikasies, soos bv. Snykant no. 71. Indien die pH van die water >6 moet dit aangepas word tot tussen 4.5 en 5 voor Corasil E® bygevoeg word.

	Kultivar	**Vrugdeursnit (mm)**
Lemoene	Delta, Valencia, Navels	18-25
Clementines	Nules (swaar set)	8-11
	Oroval (histories klein)	12-15
	SRA (swaar set)	8-10
	SRA (medium set)	10-12
	Nova (geen toediening)	X
Pomelos	Marsh, Star Ruby, Rosé	16-28
Satsumas	Owari, Miho-Wase	15-20

Maxim® is geregistreer met 'n onthoudingsperiode van 120 dae tussen toediening en oestyd en word aangewend teen 1 tablet/100 l water saam met 'n benatter.

Indien die pH van die water >6 moet dit aangepas word tot tussen 4.5 en 5 voor Maxim® bygevoeg word.

	Kultivar	**Vrugdeursnit (mm)**
Lemoene	Delta	20-24
	Valencia met sade	16-20
	Navels	20-24
Clementines	Nules	15-18
	Oroval, Marisol (histories klein)	15-18
	SRA	12-15
	Nova (geen toediening)	X
Satsumas	Owari, Miho-Wase	20-24
Pomelos	Nie geregistreer	X

Gemiddelde vruggrootte-bepaling om te weet wanneer Corasil E® of Maxim® toegedien moet word, kan soos volg bepaal word. Kies twee tot drie verteenwoordigende bome per uniforme blok en meet ten minste 50 vrugte per boom. Kies 'n deel van die boom met die hoogste digtheid van vrugte.

Meet al die vrugte, van klein tot groot, maar nie die geel vrugte nie. As die gemiddeld die vruggrootte bereik waarteen gespuit wil word, spuit dadelik. Meet vrugte met 'n "Caliper", verkieslik 'n digitale een.