Enhancing Citrus Fruit Size: An Overview of Opportunities and Achievements in ISRAEL

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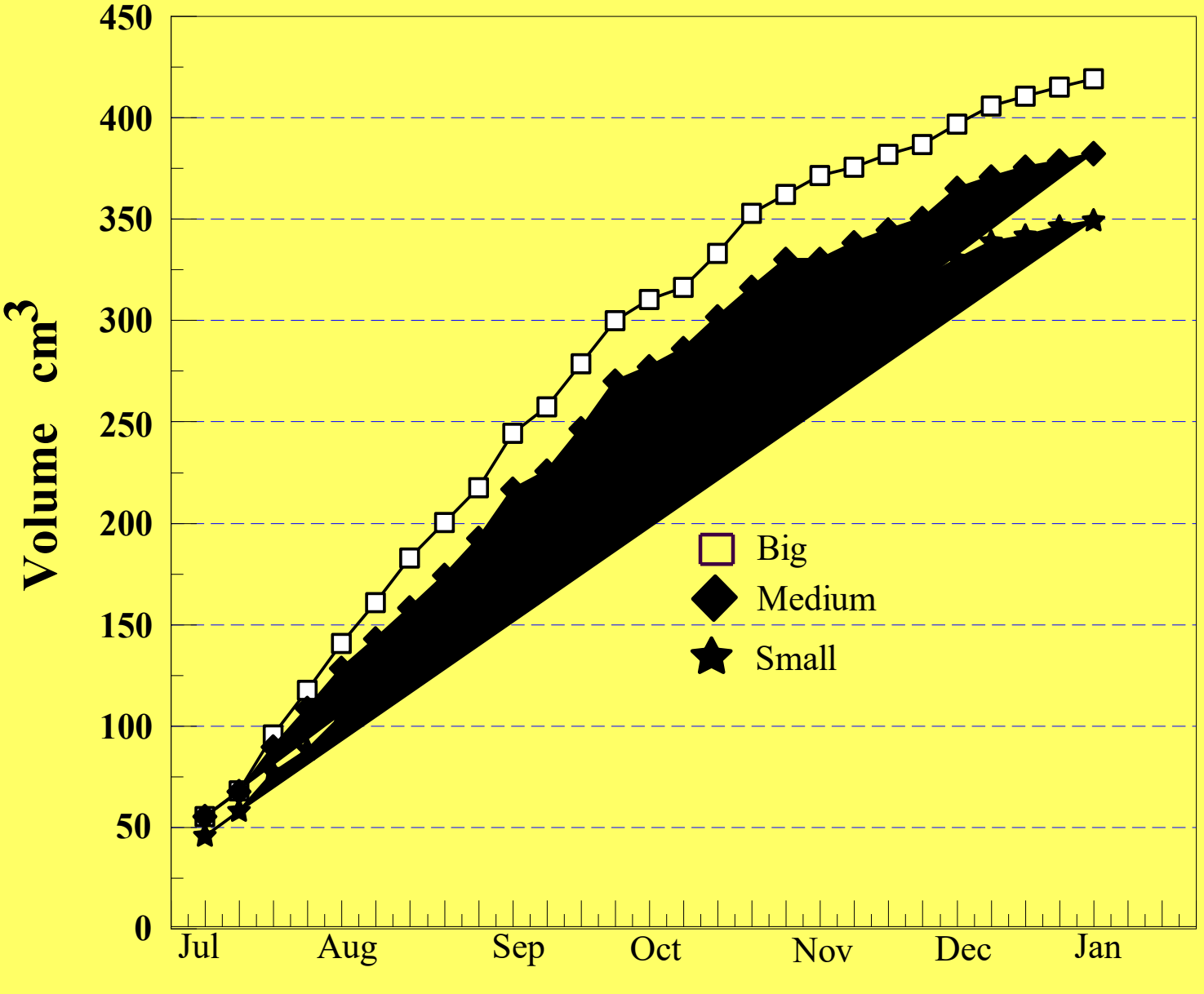
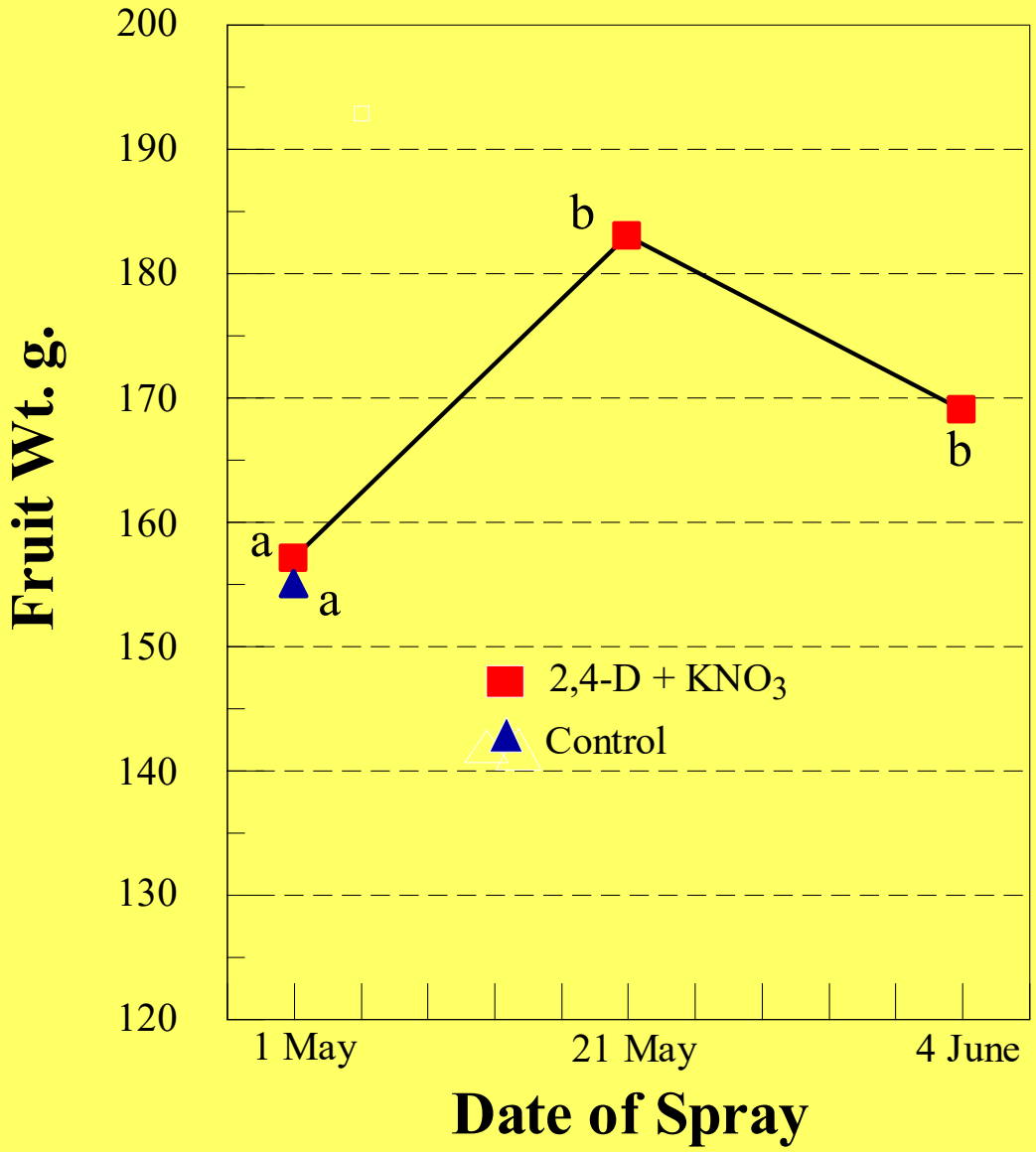
Fruit growth of 'Marsh' seedless Grapefruit



Effect of time of spray on fruit size at harvest



Effect of 2,4-D and potassium on fruit quality, 1990.

Treatment			Packed Boxes*			
			Valencia		Shamouti	
a.i.	Concentration	Acid**	No.	%	No.	%
Control	------	------	9.8 c[1]	100	12.3 c	100
2,4-D + KNO_3	20ppm + 5%	HNO_3	12.1 a	**124**	15.1 a	**123**
2,4-D + **K_2SO_4**	20ppm + 4.6%	------	11.1 b	114	14.3 b	116
2,4-D + KNO_3	20ppm + 5%	**UP[2]-50**	11.2 b	115	13.6 bc	110
2,4-D	20ppm	HNO_3	10.4 c	107	13.8 b	112
2,4-D*** X 2	20ppm	HNO_3	11.0 b	113	13.8 b	112
2,4-D*** X 3	20ppm	HNO_3	12.2 a	**125**	13.8 b	**112**
2,4-D	40ppm	HNO_3	10.1 c	104	13.4 bc	109

* Number of packed boxes filled by 1000 distributed fruits.

** Spray solution brought to pH 3.5 – 4.0.

1 - Mean separation within columns by Duncan's multiple range test at p = 0.05%.

2 – Urea phosphate.

Effect of growth regulators on packed boxes and yield of Valencia. Spray June 17, 92 Harvest April, 93.

Treatment		Packed Box*		Yield Tree^{-1}
a.i	Concentration	No.	%	Kg
Control	--------	11.4 c[3]	100	119 b
2,4-D + KNO_3	20ppm + 5%	14.5 ab	127	148 a
CPPU	10ppm	12.5 bc	110	112 b
2,4-DP[1] (dma)	50ppm	15.6 a	136	129 b
2,4-DP[2] (bge)	0.1%	13.6 b	119	114 b
2,4-DP + KNO_3	0.1% + 5%	15.2 b	133	128 b
2,4-D X2**	20ppm	13.5 b	118	112 b
2,4-D	60ppm	14.3 ab	125	116 b

* Number of packed boxes filled by 1000 distributed fruits.

** Second (X2) spray after 3 weeks.

1 dma – Dimethylamine salt.

2 bge – Butyl glycol ester.

3 Mean separation within columns by Duncan's multiple range test at p = 0.05%.

Effect of growth regulators on 'Shamouti' orange fruit quality.

Treatment		Acid	T.S.S	Packed	Yield	K
a.i.	Concen.*	%		Boxes**	kg/Tree	%
Control	-----	1.34 b	10.7 a	13.2 c	228 a	0.72 b
2,4-D + KNO_3	20ppm+5%	1.41 a	10.9 a	13.2 c	187 a	0.72 b
2,4-DP – dma	50ppm	1.32 b	10.8 a	16.5 ab	227 a	0.64 c
2,4-DP + KNO_3	50ppm+5%	1.40 a	10.9 a	17.0 a	233 a	0.94 a
2,4-DP – kv	50ppm	1.34 b	10.8 a	15.3 b	228 a	0.75 b
BA	20ppm	1.34 b	10.6 a	13.5 c	----	0.86 ab
GA_3	20ppm	1.44 a	10.8 a	13.1 c	219 a	0.73 b
GA_{4+7} + BA	20ppm	1.34 b	10.9 a	13.5 c	177 a	0.75 b

* Spray solution brought to pH 3.5 – 4.0 except for BA.

** Number of packed boxes filled by 1000 distributed fruits.

Effect of growth regulators on fruit quality of 'Star Ruby' grapefruit 1988.

Treatment		Acid	T.S.S.	Packed	K
a.i.	Concen.	%		Boxes[1]	%
Control	-----	2.34 b[4]	11.6	22.7 d	0.36 c
2,4-D[2] + KNO_3	20ppm + 5%	**2.45** a	11.9	26.3 c	**0.52** b
NAA[2]	300ppm	2.32 b	11.6	29.3 a	0.34 c
NAA + (2,4-DP)[2,3]	300ppm + 50ppm	2.29 b	12.2	28.8 b	0.33 c
NAA + (2,4-DP+KNO_3)[2,3]	300ppm+(50ppm+5%)	**2.46** a	12.4	30.2 a	**1.08** a
2,4-DP + KNO_3 + L-77	50ppm+KNO_3+0.025%	**2.27** bc	11.7	28.8 b	**0.53** b
2,4-D + KNO_3 + L-77	20ppm+KNO_3+0.025%	**2.38** ab	11.6	26.7 c	**0.40** b

1- Number of packed boxes filled by 1000 distributed fruits.
2 - Spray solution brought to pH 3.5 – 4.0.
3 - Application after 3 weeks.
4 - Mean separation within columns by Duncan's multiple range test at p = 0.05%.

Effect of growth regulators on fruit quality of 'Shamouti' orange. 1998.

Treatment		Acid	T.S.S.	Packed box*		Yield/Tree	
a.i.	Concen.	%		No.	%	Kg	%
Control	-----	1.41ab[1]	10.4	26.31 c	100	134ab	100
2,4-DP dma	50ppm	1.36 b	10.7	32.85 a	126	191 a	143
2,4-DP k	50ppm	1.41 ab	10.6	30.97 b	118	142ab	106
2,4-DP dma + KNO_3	50ppm+5%	1.48 a	10.7	32.75 a	125	162 a	120
2,4-DP k + KNO_3	50ppm+5%	1.46 a	10.8	33.21 a	126	174 a	129
3,5,6-TPA[2]	15ppm	1.45 a	11.0	28.64 bc	109	121 b →	90

* Number of packed boxes filled by 1000 distributed fruits.

1 – Mean separation within columns by Duncan's multiple range test at P = 0.05%

2 – 3,5,6 trichloro – 2 – pyridyl oxyaxetic acid.

Effect of potassium nitrate with 2,4-D on cell number in the albedo. Measurements were taken 30 days after spray.

Treatment		No. of Cells $1^{-1}mm^2$	
a.i.	Concentration	Equator	Stem end
Control	--------	86 ± 1.7	75 ± 0.4
KNO_3+2,4-D	5% + 20ppm	89 ± 1.8	77 ± 1.5

Effect of growth regulators on fruit quality of 'Michal' tangarine. 1993.

Treatment		Yield	Fruit #	Fruit Distr. %			Income
a.i.	Concen.	Kg	Tree^{-1}	S	M	B	INS*
Control	-----	82.4	1305 a	70	19	11	55
NAA	300ppm	108.5	1655 a	68	22	10	79
Olital	300ppm	100.3	1457 a	59	25	16	98
2,4-DP dma	100ppm	65.7	693 b	21	25	54	104

* Income achieved by 2.0 Israeli new shekel Kg^{-1} for B size and 1.5 INS for M size

Effect of growth regulators on fruit quality of ‘Murccot’. 1993.

Treatment		Yield	Fruit #	Fruit Distr. %		
a.i.	Concen.	Kg	Tree^{-1}	S	M	B
Control	-----	50.2	697	2.2	11.0	86.8
NAA	300ppm	26.4	336	3.8	11.0	85.2
Olital	300ppm	35.7	460	2.5	12.6	84.9
2,4-DP dma	100ppm	15.4	143	---	3.9	96.1

Effect of growth regulators on fruit quality of 'Michal' tangarine. 1994.

Treatment		Yield	Fruit #	Fruit Distr. %			Acid	Income
a.i.	Concen.	Kg	Tree^{-1}	S	M	B	%	INS*
Control	-----	98 a	1586 a	74.9	11.3	13.8	0.98	281
NAA	300ppm	55 b	593 c	23.8	18.6	57.6	1.16	342
2,4-DP dma	80ppm	87 a	1252 b	41.1	27.8	31.0	1.09	420
2,4-DP+KNO_3	80ppm+5%	88 a	1069 b	31.3	18.3	50.4	1.12	562

* Income achieved by 2.0 Israeli new shekel Kg^{-1} for B size and 1.5 INS for M size

Chemicals tested over the years to increase fruit quality on different varieties.

Chemical	Concen. ppm or %	Surfactant*	Combin.	Effect**		
				Increase	Thinning	Acid
2,4-D	20 – 60	Extravon	-----	++?	-----	-----
2,4-D	20 X2	"	-----	++?	-----	-----
2,4-D	20 X3	"	-----	+++?	-----	-----
KNO_3	5%	"	-----	++	-----	++
2,4-DP kv	60	" , L-77	5% KNO_3	++	-----	-----
2,4-DP dma	60	" , L-77	5% KNO_3	+++++	0 - +	-----
2,4-DP bge	0.1 %	"	5% KNO_3	++	++	-----
Quinmerac	0.02 %	"	-----	+	-----	-----
CPPU	10 – 20	"	-----	+	-----	-----
NAA	300	"	5% KNO_3	+?	++++	-----

* Extravon surfactant produce by Novartis, Switzerland. L-77 produce by Witco, USA.
** + small, +++++ big, ? Variable data between years.

Chemicals tested over the years to increase fruit quality on different varieties.

Chemical	Concen. ppm or %	Surfactant*	Combin.	Effect**		
				Increase	Thinning	Acid
BNOA	100 - 300	Extravon	-----	++ ?	-----	-----
Folicote	2%	-----	-----	No	-----	-----
Dicamba	20	"	-----	++ ?	-----	-----
GA_3	20 – 25	"	-----	No	-----	-----
Promalin	20 – 25	"	-----	No	-----	-----
Fengib	20	"	-----	No	-----	-----
HF-Calibra	13	"	-----	+	-----	-----
Triclopyre	15 - 20	"	KNO_3 5%	++	+++	-----
2,4-D + KNO_3	20 + 5%	" , L-77	-----	++++	-----	++
2,4-DP + KNO_3	20 + 5%	" , L-77	-----	+++++	-----	++

* Extravon surfactant produce by Novartis, Switzerland. L-77 produce by Witco, USA.
** + small, +++++ big, ? Variable data between years.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