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Precision Farming in citrus



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Site Selection

Root Stock Selection

Nutrient and water use efficiency

Canopy Management

Bahar Treatment

Decline Management

Hygiene and Pant Protection



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Citrus

Side selection:

- Side should be free from any hard pan layers of Calcium carbonate.
- Free from high concentration salt in the root zone.
- Frost free.

Rootstock selection

- Rootstock have most prominent effect on growth, productivity, fruit quality and longevity of the tree.
- Rootstock like Rough lemon, gives resistant against Die back diseases.
- Some of the commonly used rootstocks are sour orange (best rootstock for Sweet orange), rough lemon (Tolerant to virus), Rangpur lime.



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Nutrients And water use efficiency

- Micronutrients loving plant.
- NPK- 450: 450:900 g / Tree.

Nutrient Supplement	Quantity (Kg)
Zinc sulphate	2.5
Copper Sulphate	1.5
Magnesium sulphate	1.0
Ferrous sulphate	1.0
Boric acid	1.0
Slake lime	1.0
Urea	1.0
water	4.5

Irrigation



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Canopy management

- Training and Pruning – Trees are trained to single stem with 4-6 well spaced branches for making the basic frame work. Pruning is given to bearing tree to get quality and better yield.

Bahar treatment

- Mandarin broom thrice in a year under equitable climate of south and central India.
- There three bahar in *Citrus spp*- Ambe, Mrig and Hast bahar.
- Different methodes of bahar treatment-Root exposure, flower thinning, Application of Growth regulators (NAA) and water withheld.

Decline Management

- After fruitful production of for about 15 years, mandarin orchards start bearing little crop and become uneconomical.
- Show symptoms of ill health and decline



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- Good cultural practices, improvement in soil fertility and drainage, resistant root stock, control of insect pest, nematode and diseases are useful in minimizing the this incident.

Hygienic and Plant protection

- Pest -Citrus Psylla, Leaf minor, Aphids, Scales, trunk borer.

Management

- ✓ Used of natural enemies- Lady bird beetle, Syrphid fly.
- ✓ Malalathion (0.05%), Carbaryl (0.1%),
- Diseases- Pink disease, Greening, Citrus canker and Cylosorosis.

Management

- ✓ Zn Application for greening
- ✓ Use of tolerant rootstock (Rangpur lime)
- ✓ Application of Streptomycin sulphate (500 ppm) For citrus



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Effect of Growth Regulators and Chemicals on Fruit Yield and Quality of Hasta Bahar Flowering in Acid Lime (*Citrus aurantifolia*) cv. Balaji

Lakshmi *et.al.*, 2014

Effect of plant growth regulators and chemicals on summer fruit yield of acid lime at Tirupati



Treatments	Fruits weight(g)			No of fruits/tree			Yield/tree (kg)		
	2011-12	2012-13	mean	2011-12	2012-13	Mean	2011-12	2012-13	mean
T 1	28.50	34.33	31.42	205.00	496.67	350.84	5.74	20.00	12.87
T 2	40.00	38.00	39.00	280.00	601.67	440.84	11.48	26.00	18.74
T 3	38.50	38.33	38.42	190.00	627.67	458.84	10.00	30.00	20.00
T 4	42.25	40.00	41.12	352.00	706.67	529.34	14.15	34.00	24.08
T 5	40.12	39.07	39.60	295.00	636.67	465.84	14.00	32.33	23.17
T 6	38.15	37.67	37.91	376.00	583.33	429.67	11.80	28.00	19.90
T 7	37.75	39.00	38.38	270.00	586.67	438.34	10.17	28.33	19.25
T 8	36.50	35.33	35.92	265.00	590.00	427.50	9.54	26.00	17.77
T 9	35.40	36.67	36.04	252.00	566.67	409.34	9.27	26.00	17.64
T 10	34.00	37.00	35.50	245.00	566.67	405.84	8.82	24.67	16.75
T 11	33.75	33.00	33.38	236.00	578.67	407.34	8.33	26.33	17.33

T1=control(water spray).T2= GA350 ppm june+cycocel 1000 ppm september.T3=GA3 100 ppm june+cycocel 1000 ppm sep
 T4=T2+KNO3 1% in october.T5=T2+KNO3 2% in oct T6=T2+salicyclic acid 100 ppm in oct.T7=T2+salicyclic acid 200 ppm in
 oct. T8= T3+kno3 1% in oct, T9 =T3+KNO3 2% in oct,T10=T3+ salicyclic acid 100ppm in oct, T11= T3+salicyclic acid 200ppm
 in oct.



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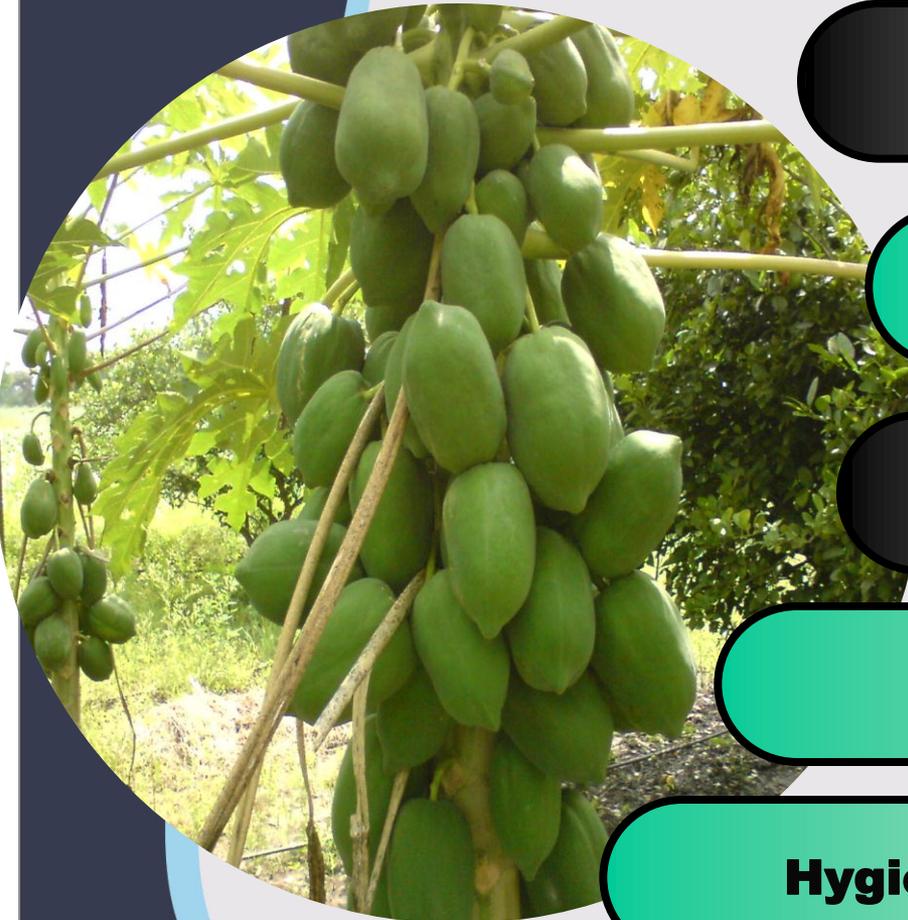
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Precision Farming in Papaya



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Site Selection

Use of Gynodiocious Varieties

Sex expressions and Thinning

Vermicompost

Drip Irrigation and Fertigation

Mulching

Hygiene And Plant Protection



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Papaya

Site Selection

- Papaya plants are very much susceptible to water logging.
- Even 24 hours stagnation of water may kill the well-established orchard.
- Therefore, it is essential to select well drained soil for papaya.
- It is also susceptible to damping off in nursery stage.
- It can be overcome by proper selection of site.

Gynodioecious Varieties

- A large number of varieties are cultivated in India Based on sex expression,
- papaya varieties can be classified either as dioecious or gynodioecious. The dioecious varieties produce male and female plants in a 1:1 ratio when propagated from seeds.
- However, gynodioecious varieties produce female and bisexual (hermaphrodite) in a 1:2 ratio. Use of gynodioecious



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Irrigation Management

- Papaya is a shallow rooted crop and is highly sensitive to fluctuation of soil moisture.
- Irrigation at 60-80 per cent available soils moisture depletion is found optimum for papaya.
- The crop is extremely sensitive to collar rot under flood irrigation where water comes in direct contact with the trunk.
- Drip irrigation of papaya with 60 per cent of evaporation replenishment was found to be optimum.
- Daily irrigation of papaya with 2 emitters/plant placed midway between the trunk and skirtline was found to be ideal for papaya growing.

Sex Expression and Thinning

- Satellite chromosome determines sex in papaya.
- Keeping 5 per cent male plants in the orchard for proper pollination. other male plants should be removed.



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Hygiene and plant protection

a) Viral Diseases

- Mosaic, leaf curl and ring spot.
- papaya ring spot virus is common in north India, Karnataka and Andhra Pradesh.
- The virus is usually transmitted by any form of aphids and these vectors should be controlled by employing systemic insecticides such as dimethoate 30 EC @ 2ml/litre.

b) Nematodes

- Root knot (*Meloidogyne* sp.) and Reniform (*Rotylenchulus reniformis*) can damage the root system and cause yield reductions.
- Controlled by the application of carbofuran 3 G @ 3 g/ polybag at nursery stage and 15-20 g/plant in the main field. Neem cake 250g + carbufuran 1g a .i. + *Pseudomonas fluorescens* formulation (4 g) can be applied in each pit.



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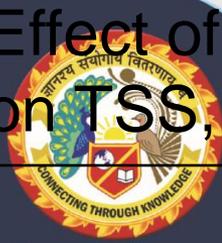
Fertigation in papaya

Effect of different levels of irrigation and fertilizers through drip



Treatments	Fruit bearing height (cm)	Number of fruits/plant	Fruit yield (kg/plant)	Fruit weight (kg)	Fruit Length (cm)	Fruit circumference (cm)
T1 Control	46.85	27.81	33.78	1.28	18.04	42.91
T2 0.6 PEF + 40% RDF	51.53	19.11	23.54	1.29	18.19	42.95
T3 0.6 PEF + 60% RDF	51.51	19.57	25.74	1.33	18.39	42.66
T4 0.6 PEF + 80% RDF	50.92	25.10	29.84	1.29	17.52	43.12
T5 0.6 PEF + 100% RDF	50.01	25.91	31.79	1.25	18.17	42.20
T6 0.8 PEF + 40% RDF	50.42	24.32	27.81	1.43	18.93	45.31
T7 0.8 PEF + 60% RDF	50.56	24.04	31.57	1.27	18.89	42.69
T8 0.8 PEF + 80% RDF	49.88	27.77	37.43	1.38	18.06	44.19
T9 0.8 PEF + 100% RDF	49.70	30.27	38.88	1.36	19.31	43.36
T10 1.0 PEF + 40% RDF	50.31	25.91	32.38	1.39	19.25	43.76
T11 1.0 PEF + 60% RDF	50.73	26.77	34.53	1.33	17.90	41.72
T12 1.0 PEF + 80% RDF	45.94	32.16	42.37	1.47	19.12	44.91
T13 1.0 PEF + 100% RDF	46.37	32.44	42.59	1.50	19.65	45.18
C .D. @ 5%	3.60	2.647	3.80	0.13	NS	NS

Effect of different levels of irrigation and fertilizers through drip on TSS, RS and TS



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Treatments	TSS (^o Brix)	Reducing Sugar(%)	Total Sugar (%)
T ₁ Control	8.76	6.24	7.64
T ₂ 0.6 PEF + 40% RDF	8.87	6.42	7.59
T ₃ 0.6 PEF + 60% RDF	8.85	7.02	7.85
T ₄ 0.6 PEF + 80% RDF	8.95	7.36	7.97
T ₅ 0.6 PEF + 100% RDF	8.79	7.25	7.84
T ₆ 0.8 PEF + 40% RDF	9.29	7.22	8.11
T ₇ 0.8 PEF + 60% RDF	9.27	7.44	8.12
T ₈ 0.8 PEF + 80% RDF	9.45	7.68	8.00
T ₉ 0.8 PEF + 100% RDF	9.49	8.05	8.33
T ₁₀ 1.0 PEF + 40% RDF	9.75	8.26	8.17
T ₁₁ 1.0 PEF + 60% RDF	10.29	8.41	9.15
T ₁₂ 1.0 PEF + 80% RDF	10.44	8.73	9.22
T ₁₃ 1.0 PEF + 100% RDF	10.37	8.43	9.13
C. D. @ 5%	0.64	0.52	0.29

Delvadia *et al* .(2000)

RDF – 200:200:250 NPK g/plant



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Mulching in papaya

Marketable fruits, virus infected fruits and mean number of aphids per leaf and per trap pan in papaya grown with various plastic mulches



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Treatments	Marketable yield (t/ha)	Yield of fruits with symptoms		Mean number of aphids per	
		(t / ha)	Mosaic (%)	Leaf	Trap pan
Silver plastic	54.0	36.0	40	6	1.3
Silver plastic with insecticide	51.5	30.0	39	2	0.5
White plastic	35.0	42.5	55	59	10.0
Yellow plastic	30.0	43.5	59	57	6.0
Black plastic	24.5	33.0	55	61	8.5
Black plastic with yellow edges	24.5	40.5	62	85	3.8
Bare ground with insecticide	19.5	40.0	67	214	60.0
Bare ground	17.0	36.0	68	212	45.0

Brown *et al.* (1993)

Effect of polythene mulch on soil temperature at different soil depths



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Treatments

Treatments	Depth (cm)	Maximum soil temperature (°C) (1 June – 15 July 1999)	
		Average	Range
1. (a) Transparent Polythene (25µm) (b) Non-solarized	10	47.3 32.7	44.9-49.8 29.3-36.2
2. (a) Transparent Polythene (25µm) (b) Non-solarized	20	41.5 30.5	39.2-42.9 28.6-31.5
3. (a) Transparent Polythene (25µm) (b) Non-solarized	30	38.3 29.7	32.7-43.9 23.9-35.6
4. Air temperature	-	32.7	27.3-38.1

Singh *et al.*(2004)



THANKS