Effect on orange baladi (*Citrus sinensis*) varieties

Crop: Orange baladi (*Citrus sinensis*) variety Baladi and Sukkari
Insect: Black parlatoria scale (*Parlatoria ziziphus*) and cottony cushion scale, (*Icerya purchasi*)
Stress 1: Three levels of nutrition deficiency, normal and excess) for nitrogen, potassium, calcium, magnesium and phosphorous.
Stress 2: Four months after nutrient treatment artificial infestation with the insects was done by attaching insect infested citrus branches (test) with seedlings using a rubber band
Stage of the plant: Vegetative

Interaction between nutrient stress and insects at plant interface

The table shows the interaction between deficiency and excess of different nutrients and insect infestation on the orange varieties

Varieties	Stress treatments	Plant response to stress	
		Type B parameter*	
		Population density of *P. ziziphus*	Population density of *I. purchasi*
Baladi	N deficient + *P. ziziphus*	113	NA
	N excess + *P. ziziphus*	494	NA
	P deficient + *P. ziziphus*	110	NA
	P excess + *P. ziziphus*	463	NA
	K deficient + *P. ziziphus*	92	NA
	K excess + *P. ziziphus*	211	NA
	Mg deficient + *P. ziziphus*	64	NA
	Mg excess + *P. ziziphus*	119	NA
	Ca deficient + *P. ziziphus*	74	NA
	Ca excess + *P. ziziphus*	285	NA
	N deficient + I. *purchasi*	NA	402
	N excess + *I. purchasi*	NA	1644
	P deficient + *I. purchasi*	NA	115
	P excess + *I. purchasi*	NA	851
	K deficient + *I. purchasi*	NA	632
	K excess + *I. purchasi*	NA	1419
	Mg deficient + *I. purchasi*	NA	792
	Mg excess + *I. purchasi*	NA	134
	Ca deficient + *I. purchasi*	NA	275
	Ca excess + *I. purchasi*	NA	74
Sukkari	N deficient + *P. ziziphus*	196	NA
	Nn excess + *P. ziziphus*	615	NA
	P deficient + *P. ziziphus*	452	NA
	P excess + *P. ziziphus*	576	NA
	K deficient + *P. ziziphus*	182	NA
	K excess + *P. ziziphus*	278	NA
	Mg deficient + *P. ziziphus*	459	NA
	Mg excess + *P. ziziphus*	263	NA
	Ca deficient + *P. ziziphus*	56	NA
	Ca excess + *P. ziziphus*	311	NA
	N deficient + I. *purchasi*	NA	420
	N excess + *I. purchasi*	NA	1559
	P deficient + *I. purchasi*	NA	415

	P excess + *I. purchasi*	NA	1763
	K deficient + *I. purchasi*	NA	1200
	K excess + *I. purchasi*	NA	210
	Mg deficient + *I. purchasi*	NA	505
	Mg excess + *I. purchasi*	NA	1062
	Ca deficient + *I. purchasi*	NA	683
	Ca excess + *I. purchasi*	NA	452

Control- Population density of P. ziziphus under control N treatment-133(Baladi);182(Sukkari), Population density of P. ziziphus under control P treatment-80(Baladi);121(Sukkari), Population density of P. ziziphus under control K treatment-65(Baladi);142(Sukkari), Population density of P. ziziphus under control Mg treatment-68(Baladi);116(Sukkari), Population density of P. ziziphus under control Ca treatment-66(Baladi);85(Sukkari), Population density of I. purchasi under control N treatment-169(Baladi);495(Sukkari), Population density of I. purchasi under control P treatment-161(Baladi);490(Sukkari), Population density of I. purchasi under control K treatment-331(Baladi);330(Sukkari), Population density of I. purchasi under control Mg treatment-444(Baladi);777(Sukkari), Population density of I. purchasi under control Ca treatment-327(Baladi);375(Sukkari).

Reference-

Salama, HS, El-Sherif AF, and Megahed M (1985). Soil nutrients affecting the population density of *Parlatoria zizyphus* (Lucas) and *Icerya purchasi* Mask. (Homopt., Coccoidea) on citrus seedlings. *Journal of Applied Entomology* 99: 471-476.

Note:

Values are presented as it is from the source article without subjecting to the calculation.

'' - For more information on parameter classification, please refer to the 'methodology' tab.*

The inference from the study: Salama et al 1985 investigated the effect of deficient and excess levels of various nutrients on the population size of scale insect *P. zizyphus* and mealybug *I. purchasi* on orange varieties Baladi and Sukkari. The authors demonstrated that excessive concentration of the nitrogen or phosphorous and deficiency of magnesium resulted in increased population density of *P. zizyphus* in Sukkari. However, magnesium deficiency had no significant effect on *P. zizyphus* populations in Baladi. Additionally, excess levels of nitrogen, phosphorous or magnesium and deficiency of potassium significantly increased the susceptibility of Sukkari to *I. purchasi* infestation. Similar was the response in orange baladi except for the observation that along with calcium magnesium did not affect insect population. **The study thus indicates that deficiency of nutrients like potassium and magnesium enhances susceptibility of orange varieties Baladi and Sukkari to *I. purchasi* and *P. ziziphus*, respectively.**

Other studies

Study 1

Effect on orange baladi (*Citrus sinensis*) variety Baladi

Interaction between nutrient stress and insects at plant interface

Crop: Orange baladi (*Citrus sinensis*) variety Baladi.
Insect: Red scale (*Aonidiella aurantia*) and purple scale (*Lepidosaphes beckii)*
Stress 1: Excess and deficiency of nitrogen, potassium, and phosphorus
Stress 2: 8 months after nutrient treatment artificial infestation with the insects was done
Stage of the plant: Vegetative

The table shows the interaction between deficiency and excess of different nutrients and insect infestation on orange variety Baladi

Stress treatments	Plant response under combined stress	
	Type B parameter*	
	Population density of *A. aurantia*	Population density of *L. beckii*
N deficiency + *A. aurantia*	6.16	NA
Excess of N + *A. aurantia*	3.42	NA
K deficiency + *A. aurantia*	5.81	NA
Excess of K + *A. aurantia*	3.56	NA
P deficiency + *A. aurantia*	4.8	NA
Excess of P + *A. aurantia*	3.57	NA
N deficiency + *L. beckii*	NA	19.71
Excess of N + *L. beckii*	NA	24.85
K deficiency + *L. beckii*	NA	29.97
Excess of K + *L. beckii*	NA	22.01
P deficiency + *L. beckii*	NA	14.05
Excess of P + *L. beckii*	NA	12.74

Control- Population density of A. aurantia under control nutrient solution treatment-3.09, Population density of L. beckii under control nutrient solution treatment -19.33

For raw data – Click here (.xlsx file)

Reference-

Salama HS, Amin AH, Hawash M (1972). Effect of nutrients supplied to citrus seedlings on their susceptibility to infestation with the scale insects *Aonidiella aurantii* (Mask.) and *Lepidosaphes beckii* (New.). *Journal of Applied Entomology* 71:395-405

Note:

Values are presented as it is from the source article without subjecting to the calculation.

'' - For more information on parameter classification, please refer to the 'methodology' tab.*

The inference from the study: Salama et al 1972 investigated the effect of deficient and excess levels of nitrogen, potassium and phosphorus on the population size of red and purple scale insects on orange baladi. The results obtained showed that excess of these nutrients increased plants resistance to red scale insect infestation and their deficiency made plants susceptible to the insect. On the contrary excess of nitrogen and potassium increased plants

susceptibility to purple scale insect. **The study thus indicates that deficiency of nutrients reduces the population density of red scale insects on orange plants.**