

Kiwifruit (*Actinidia deliciosa* [Chev.] Liang et Ferg. var *deliciosa*)

French: Kiwi; Spanish: Kiwi; Italian: Actinidia; German: Kiwi

Crop Data

Perennial vine. Harvested part: fruits.

Commercial production 3-5 years after planting.

Flowers approximately 60 days after bud burst in spring.

Fruit harvested in autumn about 160-180 days after flowering.

Plant density: 400 vines (traditional) to 800 vines (intensive) per ha.

Preferably grown in deep freely draining soils, pH 5.5-6.5.

Kiwifruit is a high water user and is generally irrigated.

Estimated annual uptake of nutrients

Nutrient uptake (estimated) - Macronutrients								
Vine age (years)	Fruit Yield (t/ha fresh weight)	kg/ha/year						
		N	P2O5	K2O	MgO	CaO	S	Cl
3	10	74	23	116	22	97	13	29
4	20	126	37	193	35	162	21	48
>5	20	94	27	160	23	129	15	43
>5	30	129	39	219	35	176	22	59
>5	40	165	50	278	45	225	28	75

Source: Smith, Buwalda & Clark, 1989

Note that the relatively high concentrations of N and K in the perennial tissues (structural roots, stem, and leaves) result in a disproportionate accumulation of these nutrients during vine development, such that developing vines may take up 50 % more N and 22 % more K than mature vines with similar fruit yields.

Plant Analysis Data

Plant analysis data (youngest fully expanded leaf) - Macronutrients							
Stage of Growth	% of dry matter						
	N	P	K	Mg	Ca	S	Cl
6 weeks	4.2	0.6	3.0	0.3	1.5	0.45	0.8
20 weeks	2.5 (OC)	0.25 (OC)	2.0 (OC)	0.45 (OC)	3.5 (OC)	0.40 (OC)	1.2 (OC)
6 weeks	1.5 (D)	0.12 (D)	1.5 (D)	0.10 (D)	0.2 (D)	0.18 (D)	0.2 (D)
6 weeks	5.5 (T)	1.2 (T)	-	-	-	-	2.5 (T)

OC = Optimum concentration - D = Deficient concentration associated with leaf symptoms - T = Toxic concentration associated with leaf symptoms

Source: Smith, Asher & Clark, 1987

Plant analysis data (youngest fully expanded leaf) - Micronutrients						
Stage of Growth	ppm dry matter					
	Fe	Mn	Cu	Zn	B	Mo

6 weeks	100	100	15	40	40	0.2
20 weeks	90 (OC)	150 (OC)	10 (OC)	20 (OC)	50 (OC)	0.2 (OC)
6 weeks	60 (D)	30 (D)	3 (D)	12 (D)	20 (D)	0.05 (D)
6 weeks	-	1200 (T)	-	1100 (T)	80 (T)	-
OC = Optimum concentration - D = Deficient concentration associated with leaf symptoms - T = Toxic concentration associated with leaf symptoms						
Source: Smith, Asher and Clark (1987)						

Special attention should be paid to B and Na as kiwifruit is extremely sensitive to excess of both of these elements in the soil. Kiwifruit is also exceptional in that it requires a comparatively high concentration of Cl in the tissues for growth. In general, production losses from nutrient disorders result mainly from a reduction in fruit number rather than a reduction in fruit size.

Fertilizer Recommendations

A mathematical model linked to a database has been developed for generating fertilizer recommendations for individual kiwifruit orchards. The model summarises nutrient fluxes within the orchard ecosystem from which a fertilizer requirement is derived. The fertilizer budget accounts for uptake, efficiency of recovery, cycling within the orchard, and any previous nutrient disorders. An example of information generated by the model is given below.

Nutrient inputs and recoveries for a typical mature kiwifruit orchard producing 30 t/ha of fruit situated 10 km from the coast							
Inputs/uptake	kg/ha						
	N	P2O5	K2O	MgO	CaO	S	Cl
Inputs							
Fertilizer	170	128	240	60	168	65	200
Cycling (1)	87	21	64	30	162	17	45
Atmospheric (2)	31	0.5	8	7	10	12	116
Total	288	149	312	97	340	94	361
Uptake	129	39	219	35	176	22	59
% Recovery	45	26	70	36	52	23	16
(1) = includes nutrients in summer and winter prunings and root turnover. (2) = includes nutrients in rainfall and N fixed by legumes in the orchard sward.							
Source: Smith et al, 1988; Buwalda and Smith, 1988							

The benefits from using fertilizer recommendations generated from the kiwifruit fertilizer model as above can be gauged from a survey of kiwifruit orchards in the Bay of Plenty, New Zealand, during the 1989/90 season.

No. of orchards	Basis of fertilizer recommendations	Average fertilizer use (kg/ha)			Average yield trays/ha*
		N	P2O5	K2O	
180	Kiwifruit Model	206	181	248	4533
78	Other	108	128	206	3842

* 1 tray = approx. 3.6 kg of fresh fruit

Preferred nutrient forms

All nutrients should be applied in plant-available forms. K should be applied preferably as chloride (unless soil Cl is high, i.e. >150 ppm and/or soil N is low). K is much more readily absorbed by kiwifruit in chloride form than as sulphate. Yield differences of up to 30 % have been recorded in favour of the chloride.

Fertilizer practice

All fertilizers including N should be applied by bud-burst in spring to maximize flower numbers. For mature vines (>3 years) fertilizers should be broadcast over the entire orchard floor.

Further reading

BUWALDA, J.G.; SMITH, G.S.: A mathematical model for predicting annual fertilizer requirements of kiwifruit vines. *Scientia Horticulturae* 37, 71-86 (1988)

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SMITH, G.S.; ASHER, C.J.; CLARK, C.J.: *Kiwifruit Nutrition. Diagnosis of Nutritional Disorders*, 2nd edition. Agpress Communications Ltd. Wellington, New Zealand (1987)

SMITH, G.S.; BUWALDA, J.G.; CLARK, C.J.: Nutrient dynamics of a kiwifruit ecosystem. *Scientia horticulturae* 37, 87-109 (1988)

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