



Interpretations for Soil Test Phosphorus and Potassium

Guidelines for Southern British Columbia

September 2010 – Order Reference No. 634.200-2

The guidelines herein are adapted from Gough (1991), whose original fertilizer recommendations were meant to produce maximum economic yields for the crop groups summarized herein at the time the recommendations were made. The guidelines assume good or above average management and favourable conditions for crop growth.

Soil test interpretations for phosphorus and potassium should take into account,

- Soil sampling and handling procedures
- Soil test laboratory methods
- The basis for the interpretations guidelines

Ideally, interpretations should be based on soil test calibration data from field and/or greenhouse experiments conducted regionally.

Interpretations and fertilizer recommendations herein are based on the “Kelowna” extraction for soil phosphorus and potassium, the last method adopted by the former provincial Soil Test Laboratory for British Columbia.

Crop advisors may have different recommendations from the guidelines herein, possibly because of differences in philosophies and changes over time in economics, crop varieties, fertilizer application techniques and other factors.

Scope

The guidelines herein apply to mineral soils (less than 17% organic carbon or less than 30% organic matter by weight) and not Organic soils (e.g. muck or peat). Mineral soils may have a surface layer enriched with organic matter.

For regions in British Columbia outside of Vancouver Island, Lower Mainland, Okanagan, Kootenays, Kamloops, Williams Lake and Quesnel, refer to soil test interpretations in the original document (Gough 1991).

The guidelines for tree fruits, grapes and berry crops are also provided separately in their respective production guides (<http://www.agf.gov.bc.ca/cropprot/prodguide.htm>).

Traditionally, there has been a reliance on tissue testing (i.e. leaf, fruit or petiole analyses) for fertility testing of these crops.

References

Bittman, S., Hunt, D., Kowalenko, C.G., Wu, X. and Forge, T. 2006. Early phosphorus nutrition in corn and the role of mycorrhizae. Pages 42-48 *in* Bittman, S. and Kowalenko, C.G. (eds). Advanced silage corn management. Pacific Field Corn Association.

Gough, N.A. 1991. (Republished in 1996). Soil and plant tissue testing methods and interpretations of their results for British Columbia agricultural soils. BC Ministry of Agriculture and Food. Final draft report.

Kowalenko, C.G. ed. 1993. Soil test analysis methods for British Columbia agricultural crops. Proceedings of a workshop of the British Columbia Soil and Tissue Testing Council. Held at Langley Conference Centre 24 November 1992. BC Min. Agric., Fisheries and Food, Victoria. 187 pp.

Neufeld, J.H. 1980. Soil test methods and interpretations. B.C. Min. of Agric, Kelowna. Publ. no. 80-2.

Table 1. Recommended phosphorus (P₂O₅) applications based on soil test phosphorus (P) values for Vancouver Island, Lower Mainland, Okanagan, Kootenays, Kamloops, Williams Lake and Quesnel

Soil Test P "Kelowna" extraction 0-15 cm sample depth		'Crop Group 2' barley, oats, rye, wheat (spring & winter)		'Crop Group 3' grasses, flax, canola, mustard, crimson clover, red clover, grass-legume (10- 50% legume)		'Crop Group 4' alfalfa, white clover, sweet clover, peas, beans (bush & pole), lettuce, spinach, corn, soybeans, cucumbers, eggplant, pumpkins, squash, grass-legume (>50% legume)		'Crop Group 5' beets, carrots, cole crops, parsnip, radishes, turnips, asparagus, bulbs, celery, sweet corn, onions, garlic, peppers, potatoes	
ppm*	Rating	P ₂ O ₅ recommended							
		kg/ha	lb/ac	kg/ha	lb/ac	kg/ha	lb/ac	kg/ha	lb/ac
0-4	VL	120	107	140	125	170	152	200	178
5-9	L-	100	89	120	107	140	125	170	152
10-14	L	80	71	100	89	120	107	144	128
15-19	L+	60	54	80	71	100	89	100	89
20-24	M-	40	36	60	54	80	71	80	71
25-29	M	30	27	60	54	60	54	60	54
30-39	M+	20	18	30	27	40	36	50	45
40-49	H-	15	13	20	18	30	27	40	36
50-74	H	15	13	20	18	30	27	40	36
75-100	H+	15	13	20	18	30	27	40	36
> 100	VH	0	0	0	0	0	0	0	0

*ppm is roughly equivalent to µg/mL, mg/L, µg/g and mg/kg

Ratings

VL (Very Low), L (Low), M (Medium), H (High), VH (Very High)

These ratings correspond to the expected economic response to phosphorus from all nutrient sources. At high ratings, no immediate response is expected and the suggested rate of fertilization is intended to maintain soil fertility. At soil test P levels where P₂O₅ recommendations are 0 kg/ha, no response is expected.

Even at high soil phosphorus concentrations that indicate no phosphorus is required, a small amount of starter phosphorus (15 to 25 kg P/ha) is recommended for corn fields. This starter phosphorus is typically applied in a band 5 cm (2 in) below and 5 cm (2 in) to the side of the seed row. Bittman et al. (2006) provides more information about the effect of starter phosphorus.

Table 2. Recommended potassium (K₂O) applications based on soil test potassium (K) values for Vancouver Island and the Lower Mainland

Soil Test K "Kelowna" extraction 0-15 cm sample depth		'Crop Group 2' barley, oats, rye, wheat (spring & winter)		'Crop Group 3' grasses, flax, canola, mustard		'Crop Group 4' alfalfa, white clover, crimson clover, red clover, sweet clover, peas, soybeans, beans (bush & pole), corn, lettuce, spinach, grass-legume		'Crop Group 5' turf, cole crops, beets, carrots, parsnip, radishes, turnips, asparagus, bulbs, celery, eggplants, cucumbers, onions, garlic, peppers, potatoes, pumpkin, squash, tomatoes	
ppm*	Rating	K ₂ O recommended							
		kg/ha	lb/ac	kg/ha	lb/ac	kg/ha	lb/ac	kg/ha	lb/ac
0-25	VL	150	134	200	178	200	178	250	223
26-35	L-	100	89	150	134	200	178	250	223
36-50	L	80	71	100	89	200	178	250	223
51-65	L	60	54	80	71	150	134	250	223
66-80	L+	40	36	60	54	100	89	200	178
81-100	M-	30	27	40	36	80	71	150	134
101-125	M	30	27	40	36	60	54	100	89
126-150	M+	20	18	20	18	60	54	80	71
151-175	H-	20	18	20	18	40	36	60	54
176-190	H	20	18	20	18	40	36	40	36
191-250	H+	20	18	20	18	40	36	40	36
> 250	VH	0	0	0	0	0	0	0	0

*ppm is roughly equivalent to µg/mL, mg/L, µg/g and mg/kg

Ratings

VL (Very Low), L (Low), M (Medium), H (High), VH (Very High)

These ratings correspond to the expected economic response to potassium from all nutrient sources. At high ratings, no immediate response is expected and the suggested rate of fertilization is intended to maintain soil fertility. At soil test K levels where K₂O recommendations are 0 kg/ha, no response is expected.

Table 3. Recommended potassium (K₂O) applications based on soil test potassium (K) values for the Okanagan, Kootenays, Kamloops, Williams Lake and Quesnel

Soil Test K "Kelowna" extraction 0-15 cm sample depth		'Crop Group 2' barley, oats, rye, wheat (spring & winter)		'Crop Group 3' grasses, flax, canola, mustard		'Crop Group 4' alfalfa, white clover, crimson clover, red clover, sweet clover, soybeans, beans (bush & pole), corn, lettuce, spinach, grass-legume		'Crop Group 5' turf, cole crops, beets, carrots, parsnip, radishes, turnips, asparagus, bulbs, celery, eggplants, cucumbers, onions, garlic, peppers, potatoes, pumpkin, squash, tomatoes	
ppm*	Rating	K ₂ O recommended							
		kg/ha	lb/ac	kg/ha	lb/ac	kg/ha	lb/ac	kg/ha	lb/ac
0-25	VL	150	134	200	178	200	178	250	223
26-35	L-	100	89	150	134	200	178	250	223
36-50	L	80	71	100	89	200	178	250	223
51-65	L	60	54	80	71	150	134	250	223
66-80	L+	40	36	60	54	100	89	200	178
81-100	M-	30	27	40	36	80	71	150	134
101-125	M-	30	27	40	36	60	54	100	89
126-150	M	20	18	20	18	60	54	80	71
151-160	M+	20	18	20	18	40	36	60	54
161-175	M+	20	18	20	18	40	36	40	36
176-190	H-	0	0	0	0	40	36	40	36
191-220	H	0	0	0	0	0	0	40	36
221-250	H+	0	0	0	0	0	0	0	0
> 250	VH	0	0	0	0	0	0	0	0

*ppm is roughly equivalent to µg/mL, mg/L, µg/g and mg/kg

Ratings

VL (Very Low), L (Low), M (Medium), H (High), VH (Very High)

These ratings correspond to the expected economic response to potassium from all nutrient sources. At high ratings, no immediate response is expected and the suggested rate of fertilization is intended to maintain soil fertility. At soil test K levels where K₂O recommendations are 0 kg/ha, no response is expected.

Table 4. Recommended phosphorus (P₂O₅) applications for new plantings of tree fruits (1st and 2nd year)

Soil Test P “Kelowna” extraction 0-15 cm sample depth ppm	‘Crop Group 1’ Apple, Apricot, Cherry, Peach, Plum P ₂ O ₅ Recommended
0 – 30	1.5 g per L soil of 11-55-0 or equivalent in the planting hole*
> 30	Less than above or 0

*Reduce rate by half on very gravelly soils to avoid root burning.
Alternatively, dissolve 27 g of 9-45-15 (or equivalent) per 4.5 L of water and apply 4 L of solution per tree after planting.