Project: Leaching evaluation conducted at Mission Viejo Country Club

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Summary

A study was designed to quantify the changes in soil chemistry that occur following leaching. Fairways 1, 2, 4, 7, 10, 12, 15 and 17 were sampled at the 150 yard mark before and after the leaching event. The soils before and after leaching were then tested using three different methods: 1) saturated paste extraction (to be summarized in a subsequent report); 2) Mehlich III extraction with KCl extractable nitrogen and 3) 1:2 soil:water electrical conductivity evaluation and conversion to a saturated paste extract. Due to a shortage of sample material, saturated paste extracts were conducted on a proportional composite of several fairways representing before and after leaching soil conditions. The key results are listed below:

- Soil salinity dropped by more than 20% in both 1:2 and saturated paste extraction methods
- Soil chloride dropped by more than 40% Mehlich III and saturated paste extraction.
- Soil nitrogen dropped by 19% using KCl extraction but no drop was detected using saturated paste extraction.

Results were disappointing for the following factors:

- Sulfur reported a small reduction that was not significant.
- Sodium reported a small reduction that was not significant

Materials and methods

Leaching was carried out using customized cycle-soak program using a 15 minute cycle and a 2 hour soak. Irrigation heads are spaced at 60 ft on a triangular pattern. Heads are Toro 730 with FCI blue nozzles running at 65 psi. Approximately 5 inches of water were applied over the three day period between July 10 – July 12, 2007.

Eight soil 1.25 inch diameter auger samples were collected from each fairway to a depth of 4 inches at the 150 yard marker before leaching on July 5th to make a composite sample for each location.

After leaching, 12 auger samples were collected on July 19th at the same areas of each fairway sampled before leaching. Insufficient sample was collected on July 5th to run both the Mehlich III and saturated paste analyses. Additional composite samples were prepared from the remaining sample materials for statistical analysis of the before and after leaching saturated paste samples. The saturated paste data in this report include the after leaching results for all fairways sampled and the pre and post leaching composite samples.

Water: Domestic water was the primary irrigation source but there was some recycled water mixing during the leaching process. The recycled water sample was collected at an access point in the main delivery line.

Key soil quality factors – Mehlich III extraction

Values represent the average of 8 samples from leached fairways and 8 samples from the same fairways before leaching. Values are significantly different when the probability that the difference in the means is due to chance is less than 5% (P<0.05). Significant and beneficial reductions have been highlighted in green while significant but detrimental changes are noted in yellow.

Parameter	Before Leaching	After Leaching	Percent Change	P[1]
pH	7.0	7.1		0.487
Organic Matter (OM%)	11	13		0.139
Sulfur (SO4-S ppm)	605	418		0.160
Phosphorous (P ppm)	321	280		0.085
Calcium (Ca ppm)	3669	3310		0.116
Magnesium (Mg ppm)	689	659		0.407
Potassium (K ppm)	373	405		0.229
Sodium (Na ppm)	764	689		0.280
Calcium percentage	61	60		0.500
Magnesium percentage	19	20		0.261
Potassium percentage	3.2	3.8	19	0.004
Sodium percentage	11	11		0.855
Electrical Conductivity (EC dS/m)	6.0	4.5	-25	0.039
Chloride (Cl ppm)	724	394	-46	0.001
Boron (B ppm)	3.6	3.5		0.556
Iron (Fe ppm)	221	220		0.971
Manganese (Mn ppm)	37	38		0.849
Copper (Cu ppm)	1.9	2.2		0.348
Zinc (Zn ppm)	22	21		0.727
Ammonium nitrogen (NH4 ppm)	7.9	8.4		0.556
Nitrate nitrogen (NO3 ppm)	63	51	-19	0.009
Total nitrogen (TOTN ppm)	71	59	-17	0.013

[1]P = Fisher's Protected LSD probability that the values are the same

Table 2. Key soil quality factors saturated paste before and after leaching.

Values represent the average of two composite samples representing fairways before leaching and after leaching. The same proportions of soils from several fairways were used to develop the before and after leaching composite samples..

Parameter	Before Leaching	After Leaching	Percent Change	P[1]
pH	6.9	6.8		0.808
Salts (ppm)	4160	3283	-21	0.144
Chloride (Cl ppm)	819	480	-41	0.058
Nitrate (NO3 ppm)	31	32		0.939
Ammonium (NH4 ppm)	14	11	-21	0.084
Bicarbonate (HCO3 ppm)	592	504		0.448
Sulfur (S ppm)	669	573		0.436
Phosphorus (P ppm)	9.2	10		0.309
Calcium (Ca ppm)	508	427		0.290
Calcium (Ca meq)	25	22		0.289
Calcium (Ca %)	38	39		0.674
Magnesium (Mg ppm)	174	136		0.217
Magnesium (Mg meq)	14	11		0.217
Magnesium (Mg %)	22	21	-5	0.088
Potassium (K ppm)	105	102		0.621
Potassium (K meq)	2.7	2.6		0.625
Potassium (%)	4.1	4.8		0.175
Sodium (Na ppm)	545	440		0.239
Sodium (Na meq)	24	19		0.239
Sodium (Na %)	36	35		0.764
Total (meq)	66	54		0.242
Boron (B ppm)	1.6	1.4		0.553
Iron (Fe ppm)	0.8	0.9		0.759
Manganese (Mn ppm)	1.2	0.7	-42	0.064
Copper (Cu ppm)	0.09	0.08		0.698
Zinc (An ppm)	0.12	0.10	-17	0.106
Aluminum (Al ppm)	1.2	1.5		0.779
ESP (estimated)	6.2	5.4		0.290
SAR (estimated)	5.3	4.8		0.255

[1]P = Fisher's Protected LSD probability that the values are the same