

THE NUTRIENT CONTENT OF ONE-YEAR-OLD
PINUS RADIATA FOLIAGE FROM TWO
SAMPLING POINTS WITHIN THE TREE

by

Jean Prince

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EXECUTIVE SUMMARY

Helicopter sampling of one year old needles from primary branches can provide an alternative to ground based sampling of one year old needles from secondary branches. For most nutrients there is a strong relationship between nutrient contents from both points. The exceptions are calcium and magnesium.

Primary sampling points generally have higher nutrient contents than secondary. The ratio of primary to secondary is generally 1:0.85.

However for the results to be used successfully for fertilizer recommendations a clear indication of which sampling point has been used must accompany any samples arriving in the laboratory.

* Sampling errors can nullify any advice given for nutrient correction.

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INTRODUCTION

Nutrient analysis for fertilizer recommendation relies on the correct material being forwarded to F.R.I. Until recently only 1 year old needles from secondary branches were acceptable. The advent of helicopter sampling has provided an efficient way of sampling forest compartments where ground accessibility is a problem. Unfortunately secondary branches are often out of reach by this method and the alternative of sampling primary branches was suggested by Coop members. To provide fertilizer recommendations based on nutrient content of primary foliage a data base of the material and its ratio to the normal secondary material was required, since advice on when to fertilise is based on the calibration of secondary foliage against proven fertiliser trials.

METHODS

Members of the F.R.I. and Industry forest fertiliser co-operative were invited to provide primary foliage samples with their normal secondary samples. These samples were all collected in late February through to the end of March when nutrients levels are stable. (Mead and Will 1976). A selection of FRI/Co-op trials were sampled at both points to extend the range of sites. A total of 472 samples, (giving 236 pairs) were used in compiling this report. Tree age ranged from 5 to 15 years. Nitrogen (N), magnesium (Mg), boron (B), and copper (Cu) were determined chemically. (FRI Bulletin 70 - Nicholson 1984) Phosphorus (P), potassium (K), calcium (Ca), manganese (Mn) and zinc (Zn) were determined by x-ray analysis. A full summary of samples used and nutrient contents appear in appendix one. Genstat was used to analyse the data for each element.

RESULTS

Strong relationships were found for N, P, K, B, Cu, Mn and Zn.

	Primary/secondary (%)	Correlation coefficient
N	88.3	0.78
P	82.6	0.64
K	92.5	0.78
Ca	85.4	0.20
Mg	79.0	0.47
B	73.5	0.60
Cu	88.4	0.84
Zn	85.3	0.69
Mn	87.9	0.89

Calcium and magnesium gave a less definite picture. Calcium appears to be site dependent with some forests having consistently lower levels in the primary with others having the reverse. Waipoua, Waitangi and Otangaroa forests had very high calcium levels in the secondary branch foliage compared to the primary branch foliage which was against the general trend. Some forests had a mixture of relationships.

Magnesium gave a similar picture with levels often extreme between the two sampling positions. If Mg or Ca deficiency is suspected secondary branch sampling would be preferable.

Copper results for two sites were abnormal. Normally Cu in secondary foliage was slightly lower than in the primary foliage. At Pipiwai and Waiomio Cu levels in secondary foliage were up to 3.5 times higher than the primary foliage. The results for these forests were so atypical that they have not been included in the calibration.

It was observed while unpacking the submitted foliage samples that some appeared more mature than normally expected for one year old needles. A second study was made of the results. Samples collected by F.R.I. staff and field staff were split into separate graphs. F.R.I. collected pairs gave a correlation of 0.84 for both N and P respectively while other collectors gave lower correlations of 0.69 and 0.59 for the same elements. The comparative graphs and correlation coefficients (r) are in Appendix 2.

CONCLUSIONS

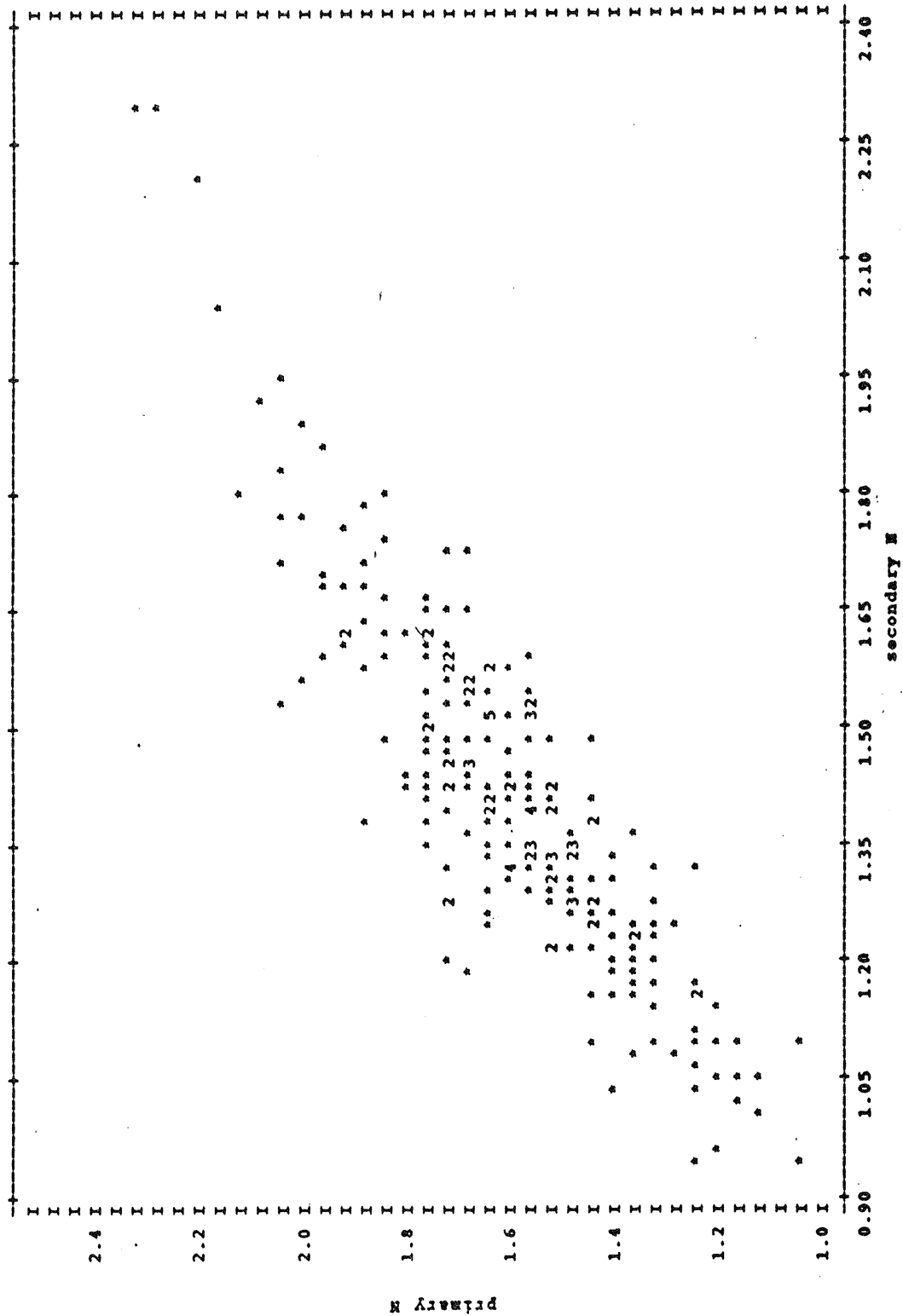
The inclusion of the conversion factors into our data base will enable us to advise on primary branch foliage with a high degree of confidence for elements other than Ca and Mg. If material is labeled incorrectly errors will occur. We are not getting consistent sampling by all collectors and the importance of staff training must be emphasized.

ACKNOWLEDGEMENTS

Grateful thanks to all who participated by collecting the foliage for this study. Also to Mrs June Watkins who prepared the samples for laboratory analyses.

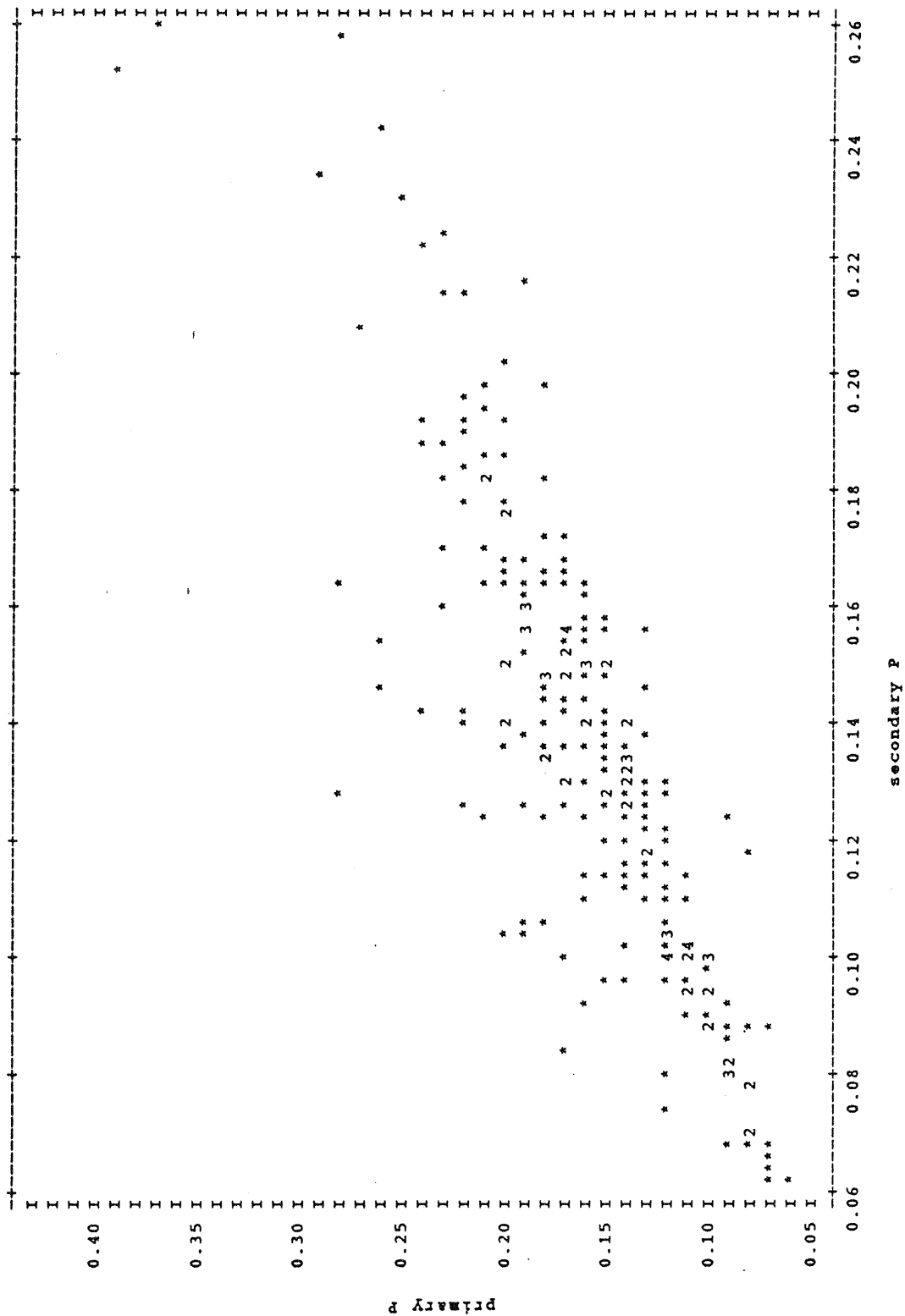
APPENDIX 1.

1. Nitrogen - Primary Foliage vs Secondary Foliage.

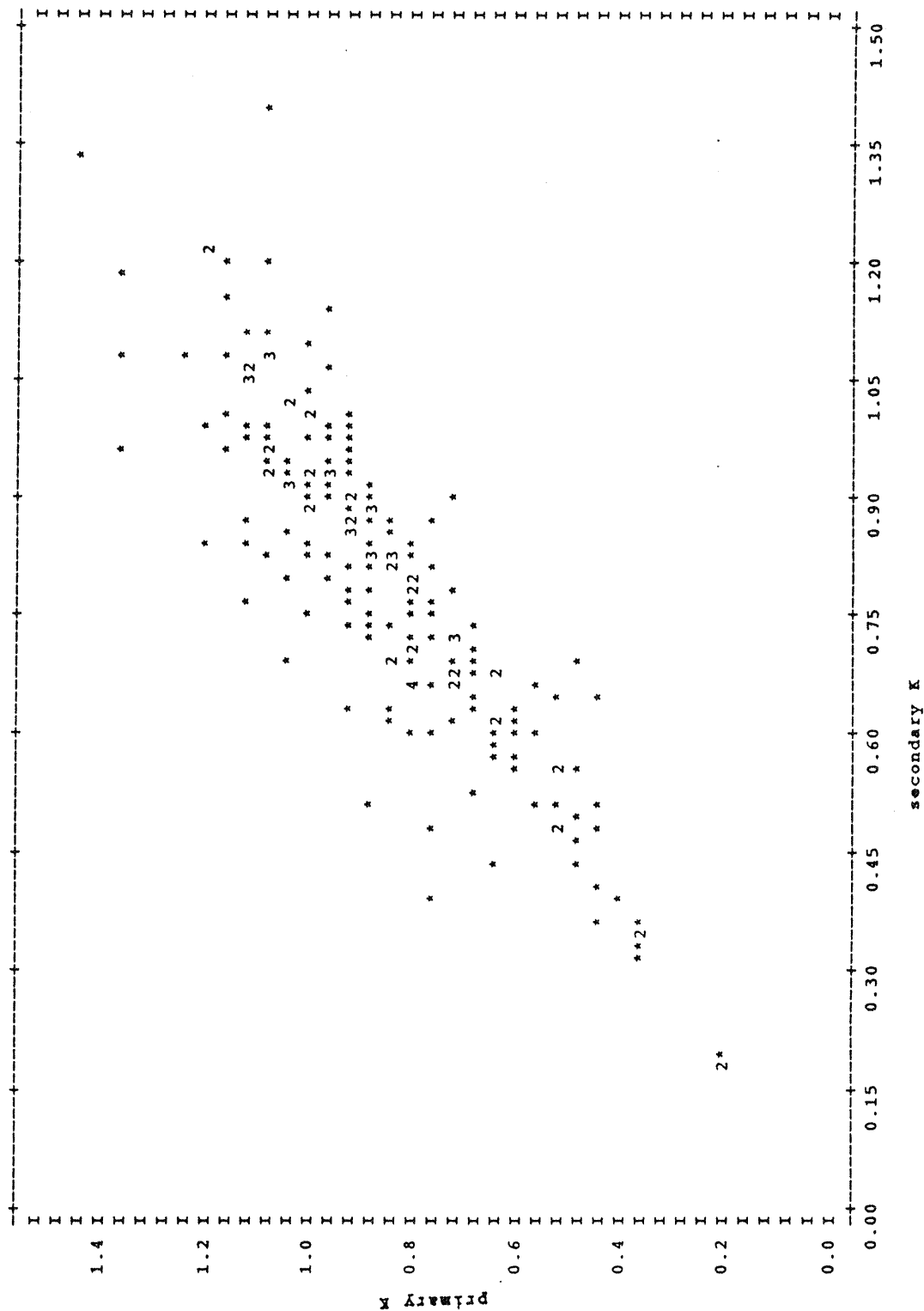


$r = 0.78$

2. Phosphorus - Primary Foliage vs Secondary Foliage.

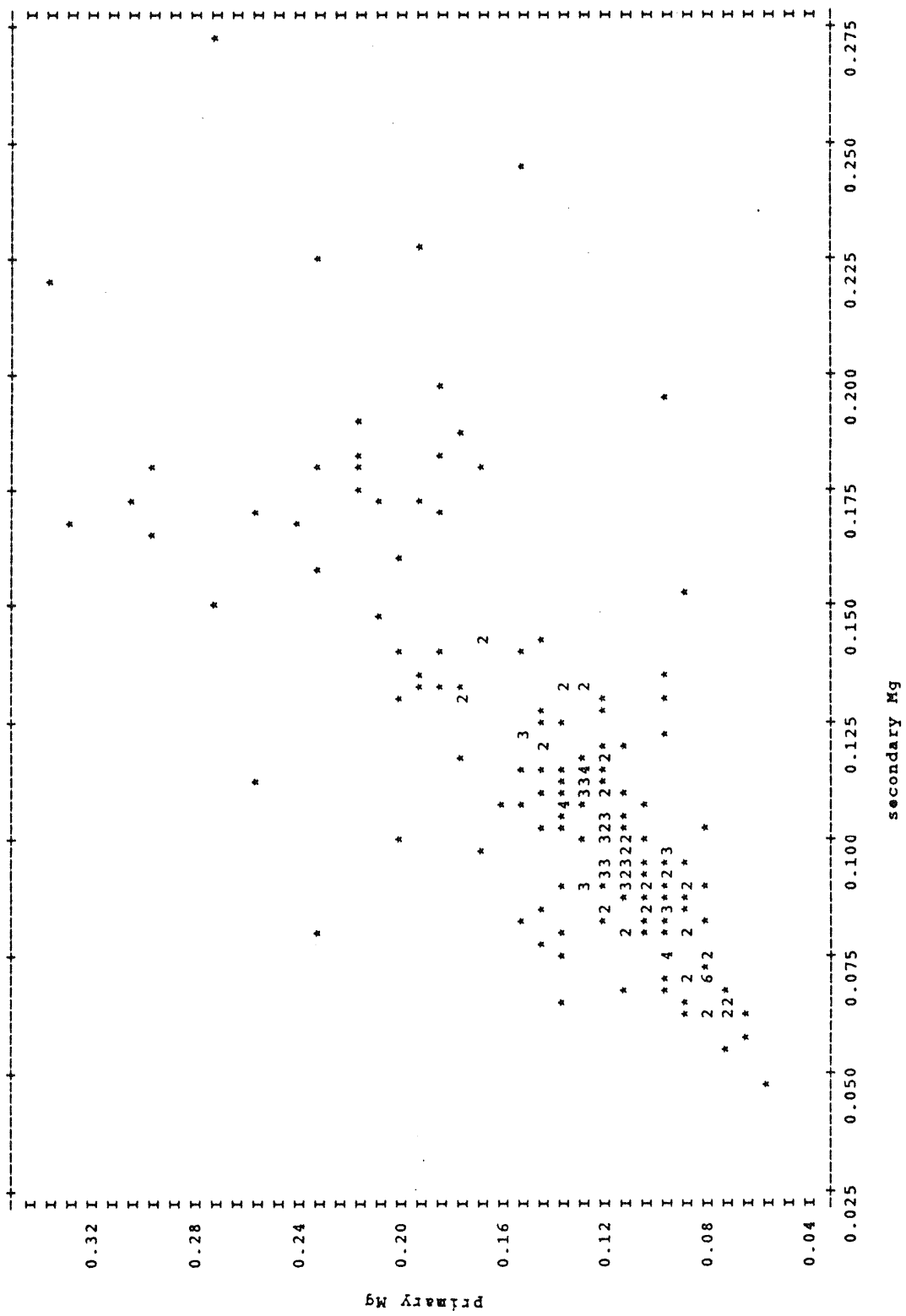


3. Potassium. - Primary Foliage vs Secondary Foliage



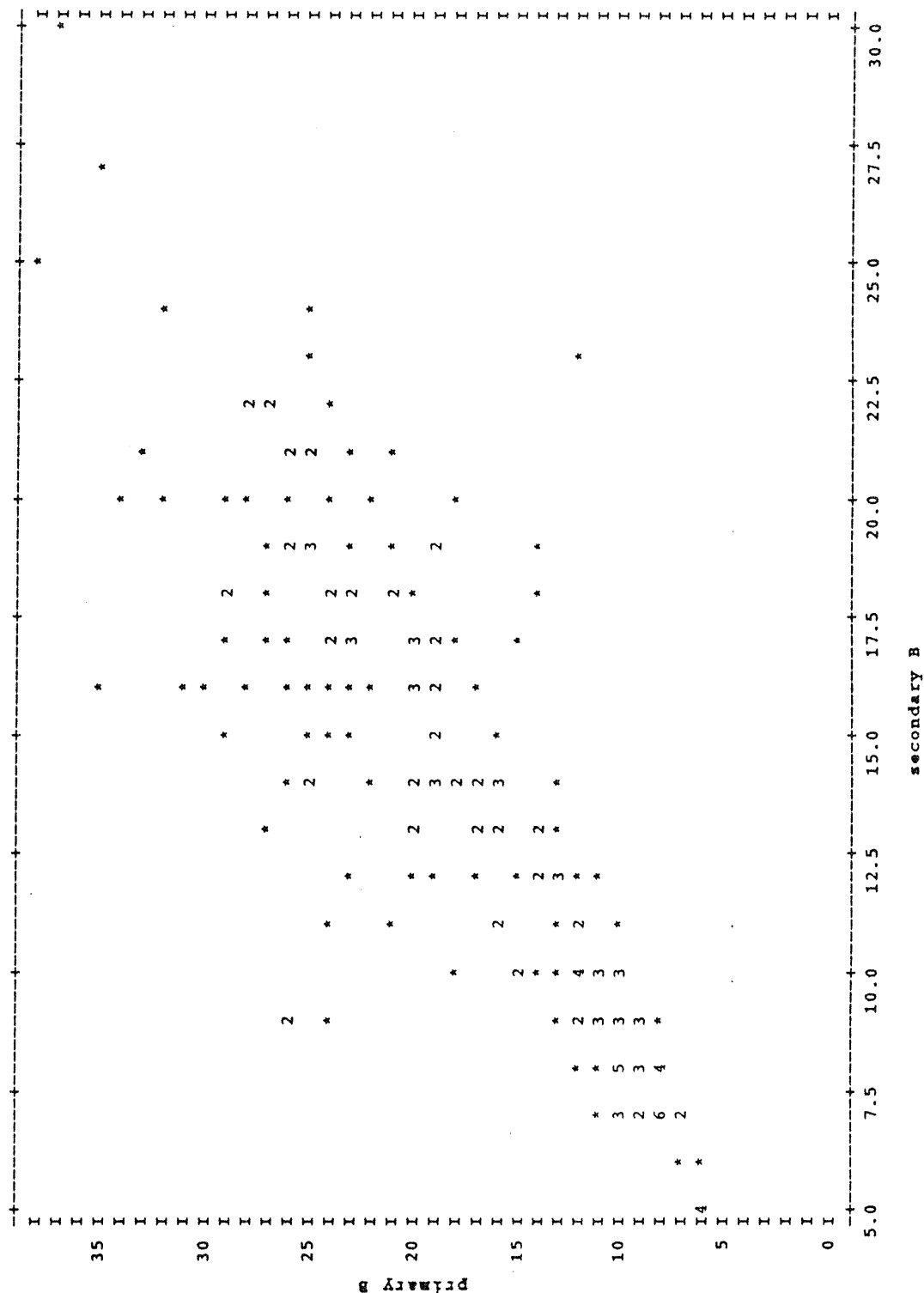
$r = 0.78$

4 . Magnesium - Primary Foliage vs Secondary Foliage



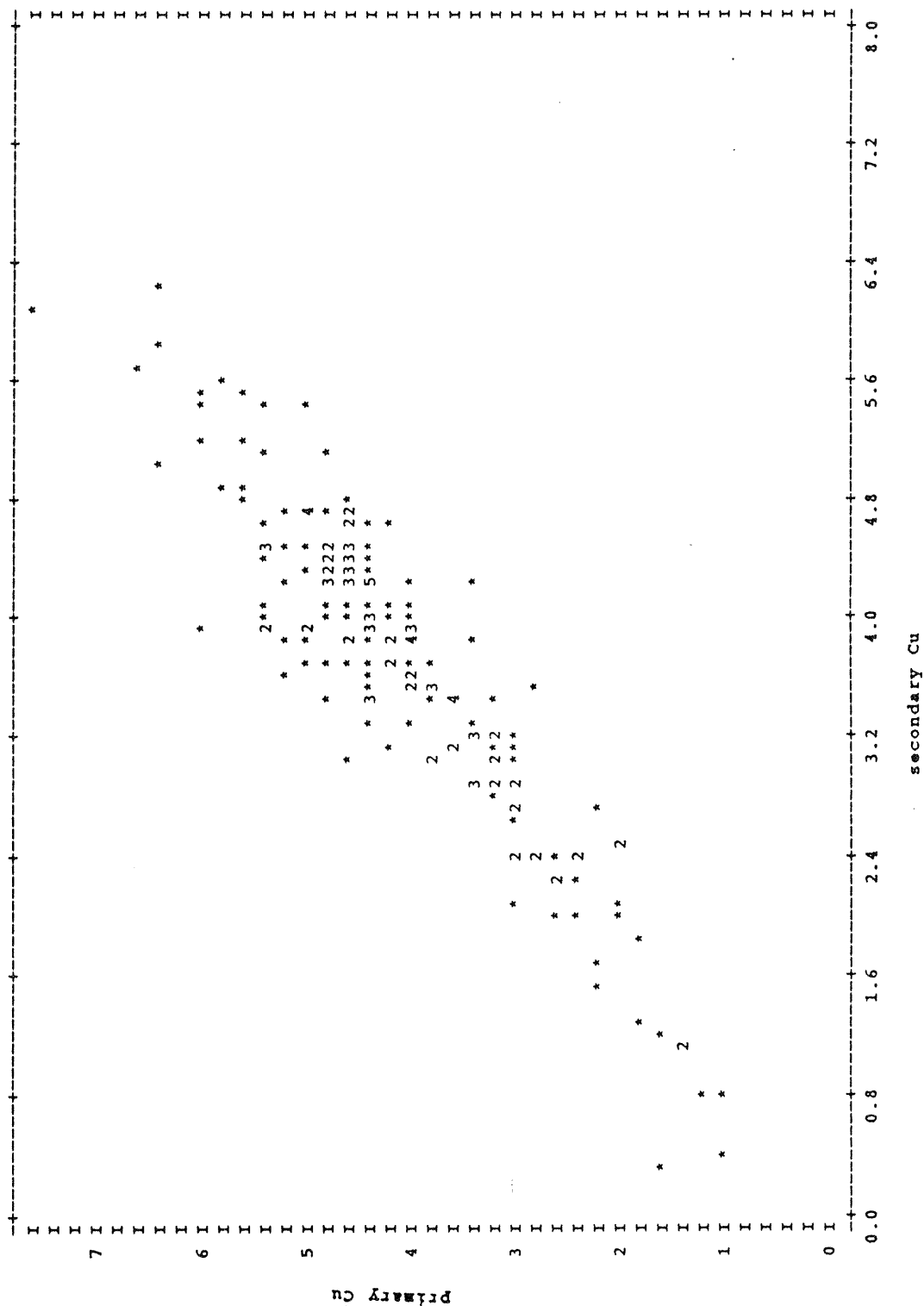
r = 0.47

6. Boron - Primaty Foliage vs Secondary Foliage.



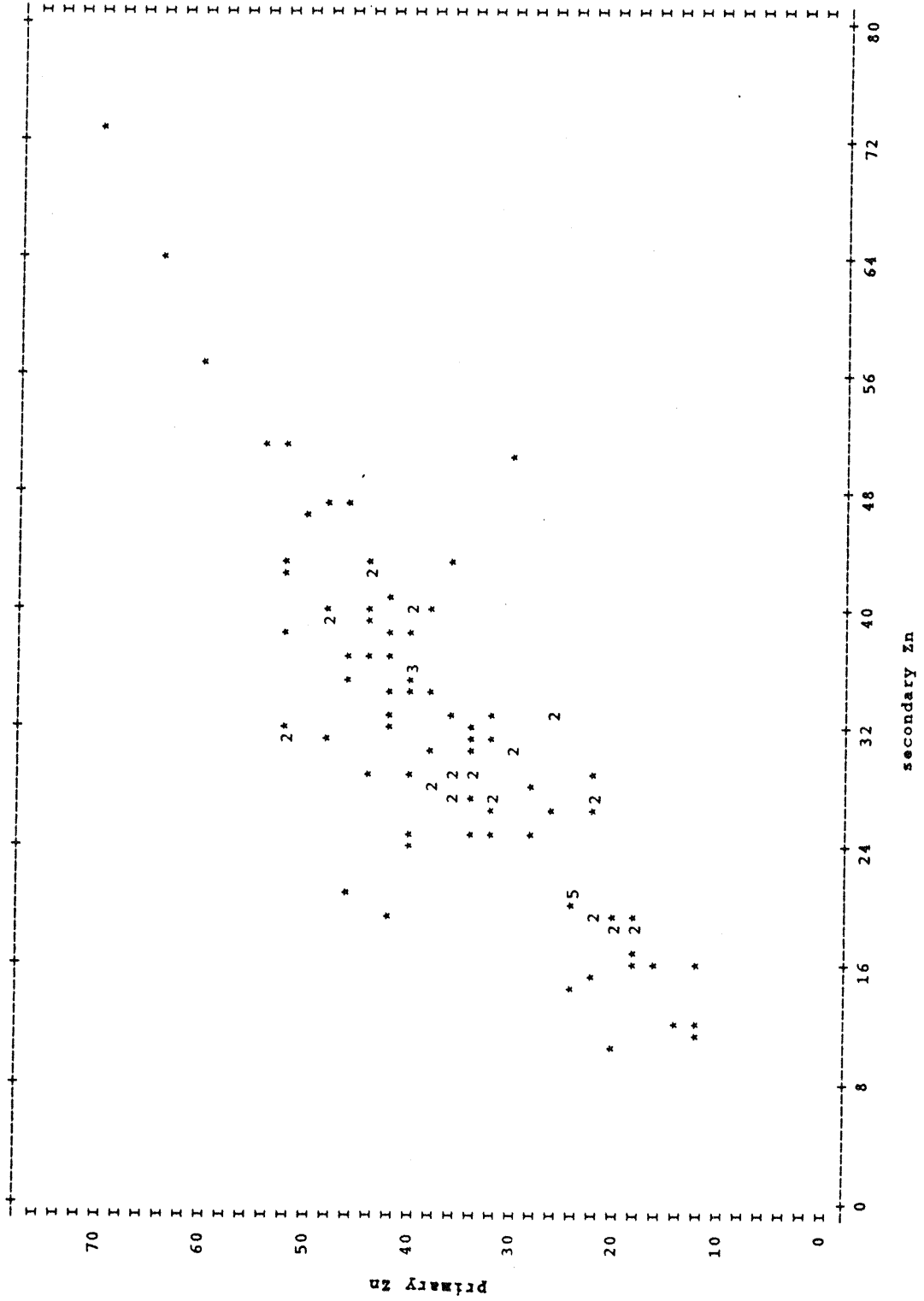
$r = 0.60$

7. Copper - Primary Foliage vs Secondary Foliage.



$r=0.84$

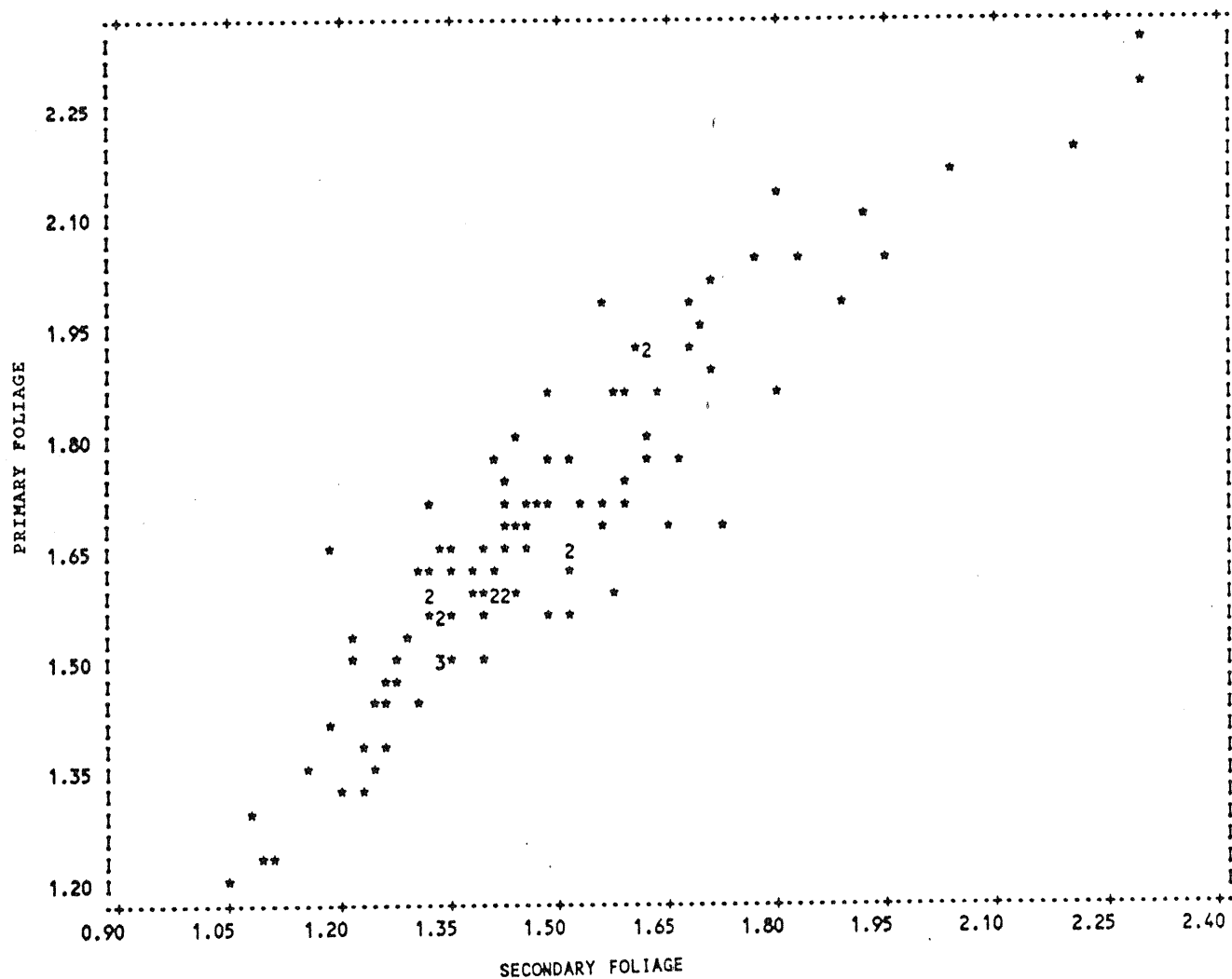
8. Zinc - Primary Foliage vs Secondary Foliage.



$r = 0.69$

APPENDIX 2.

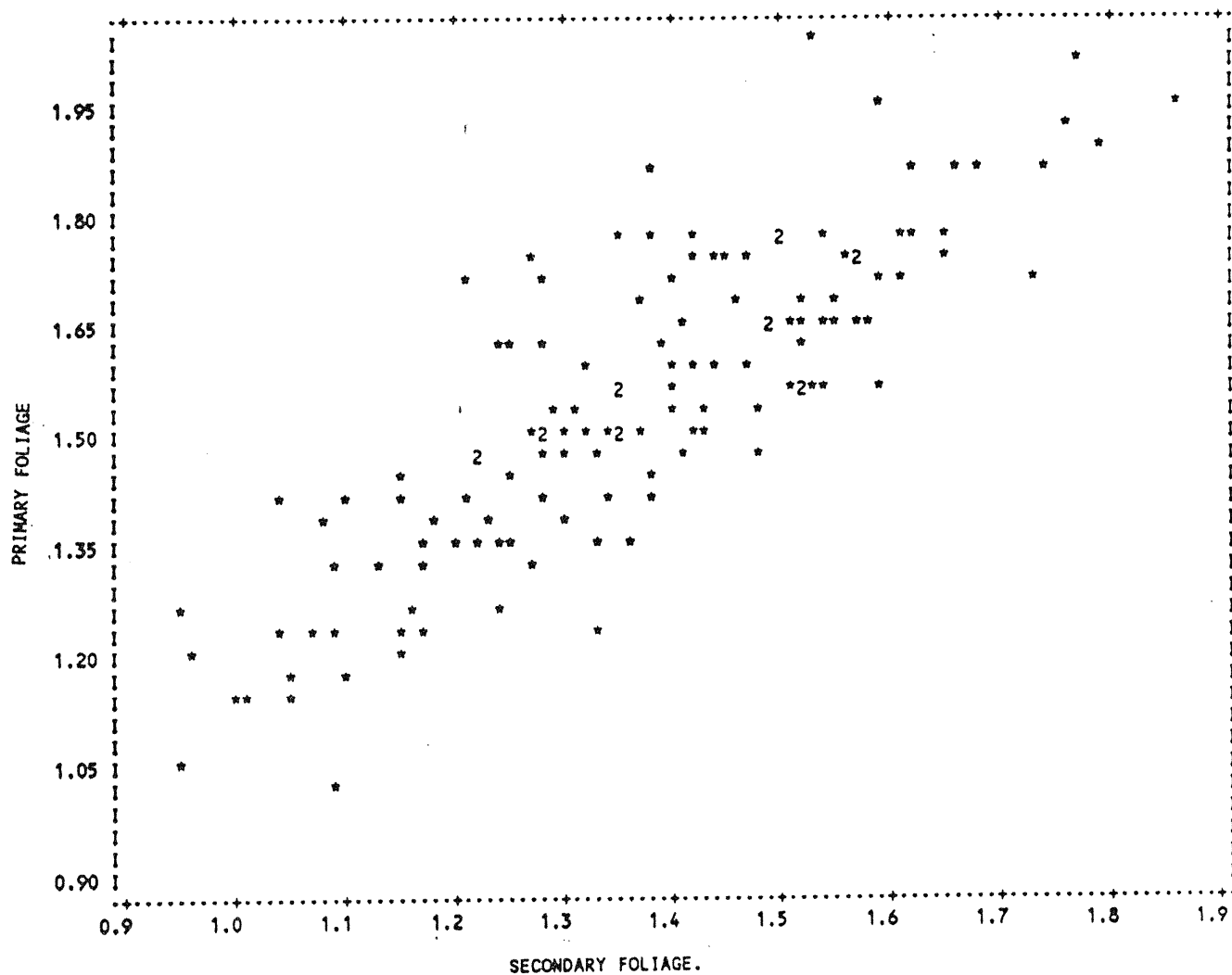
NITROGEN - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FRI STAFF



$$r = 0.84$$

APPENDIX 2 continued.

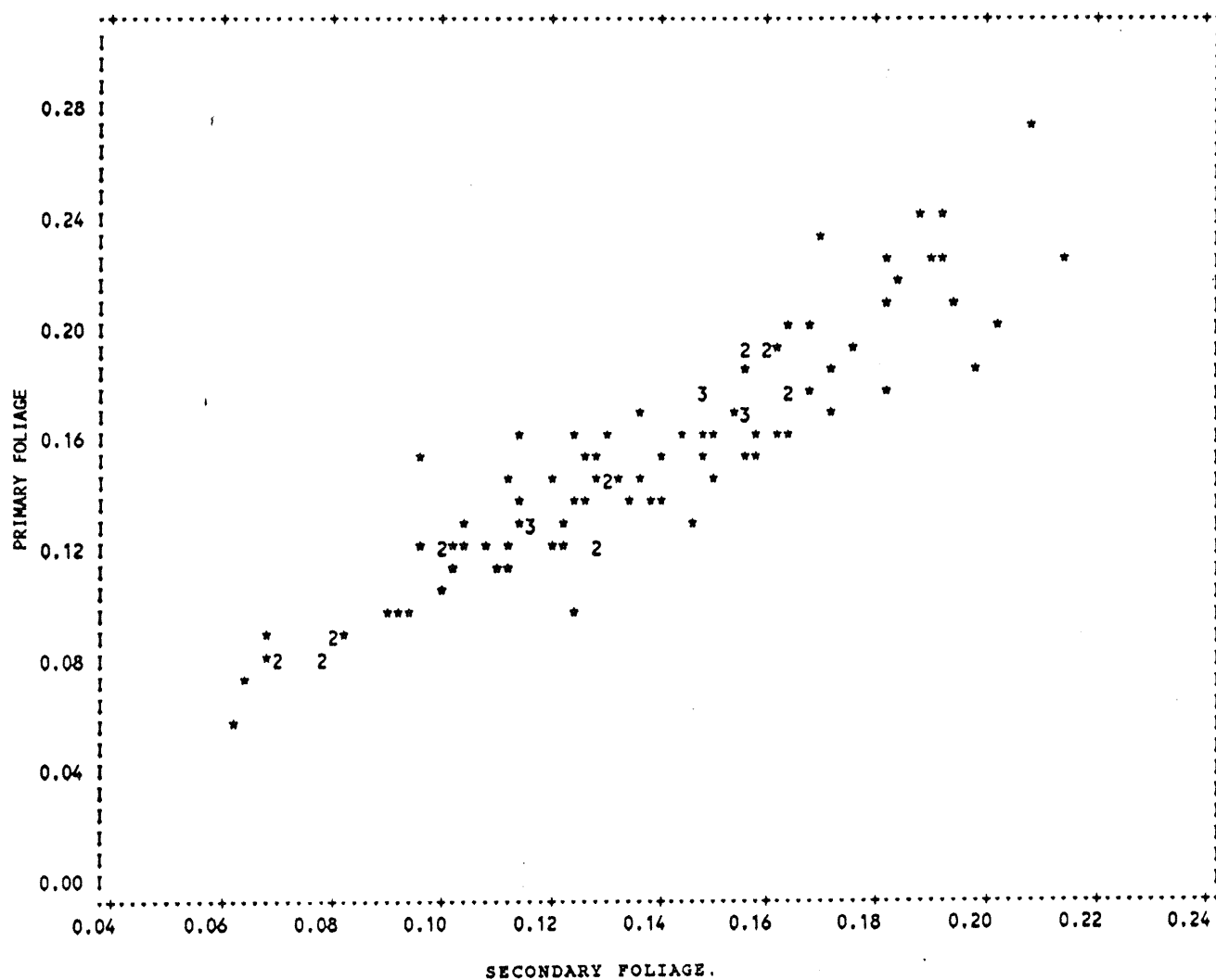
NITROGEN - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FIELD STAFF



$$r = 0.69$$

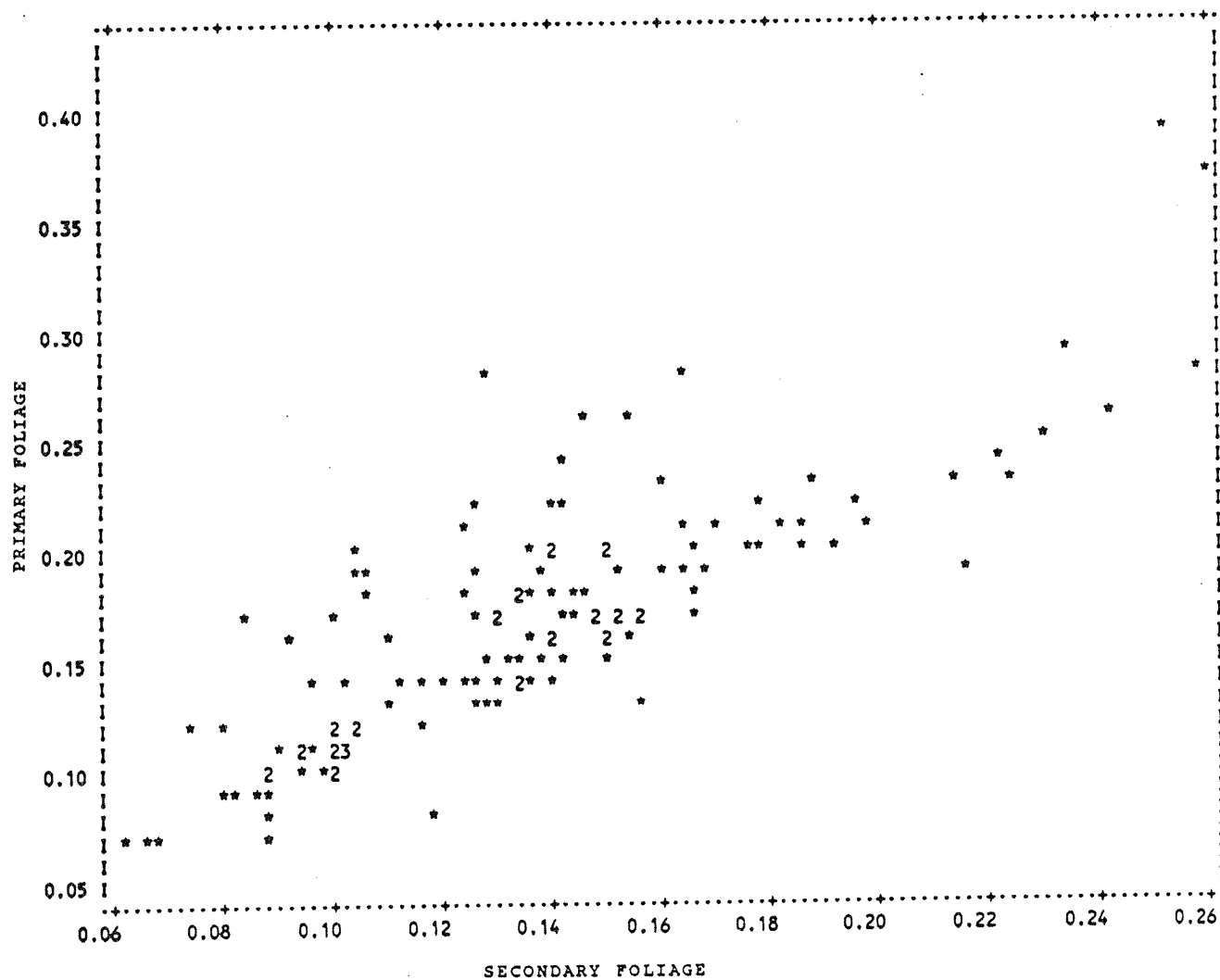
APPENDIX 2 continued.

PHOSPHORUS - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FRI STAFF



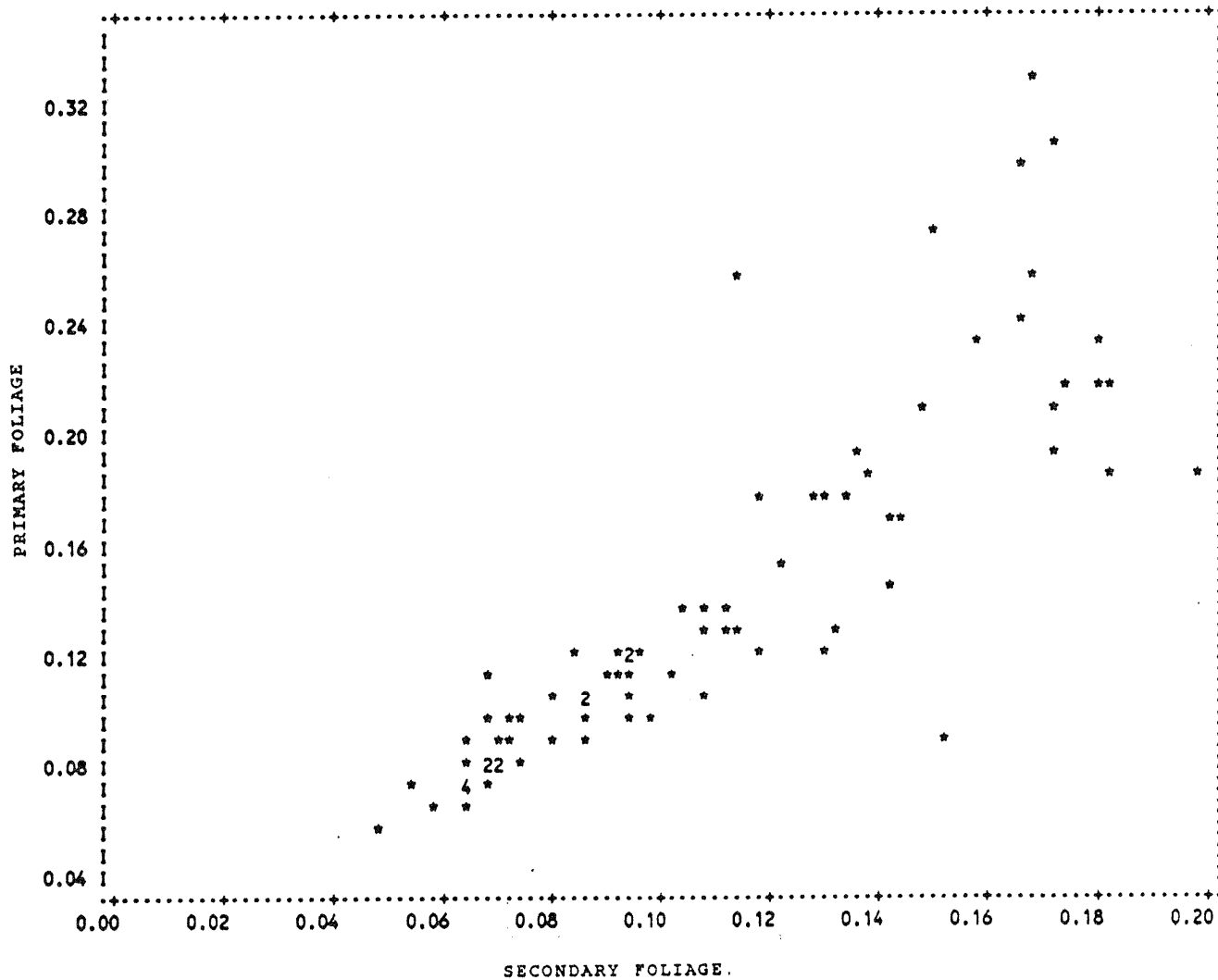
$$r = 0.84$$

PHOSPHORUS - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FIELD STAFF



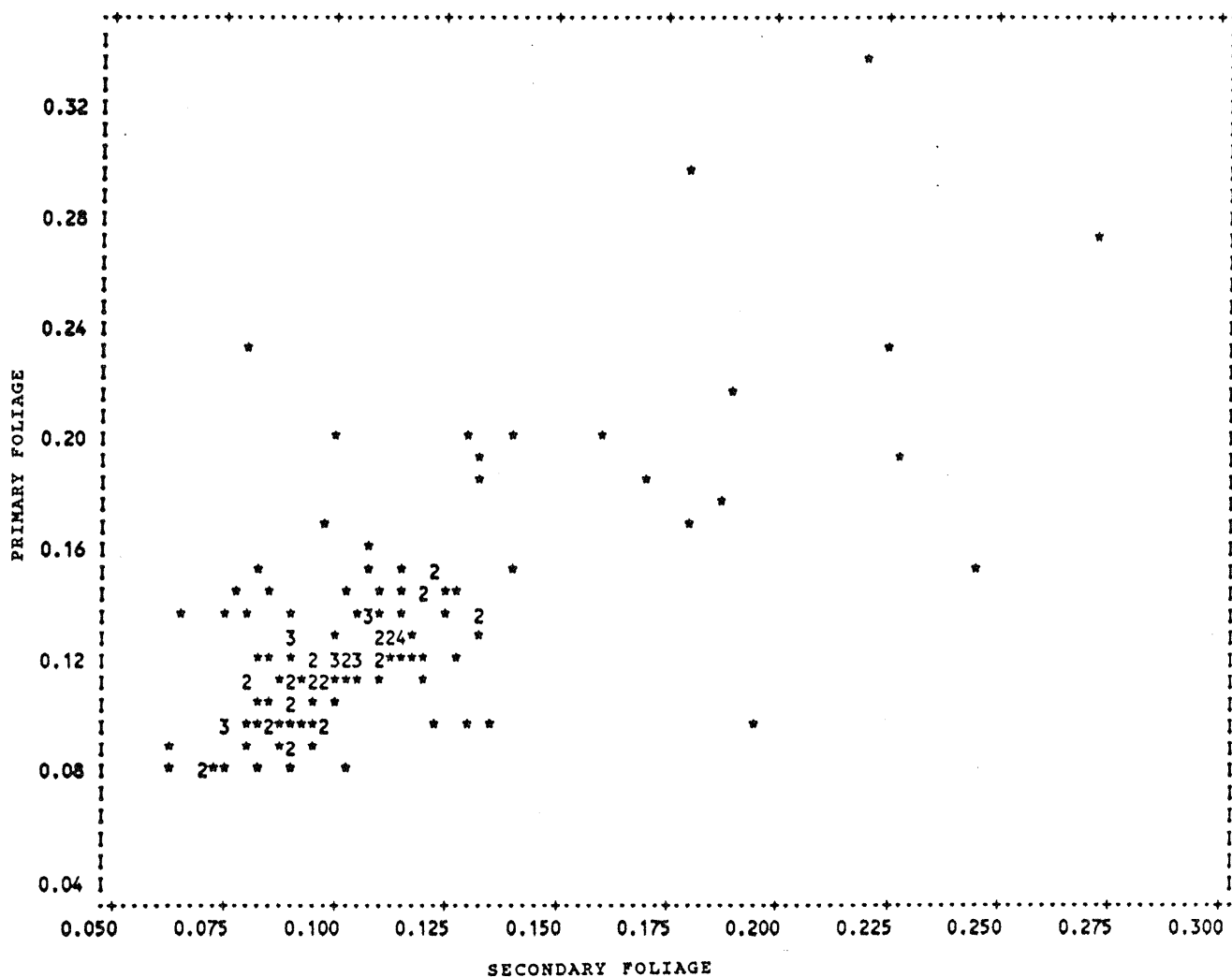
$$r = 0.59$$

MAGNESIUM - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FRI STAFF.



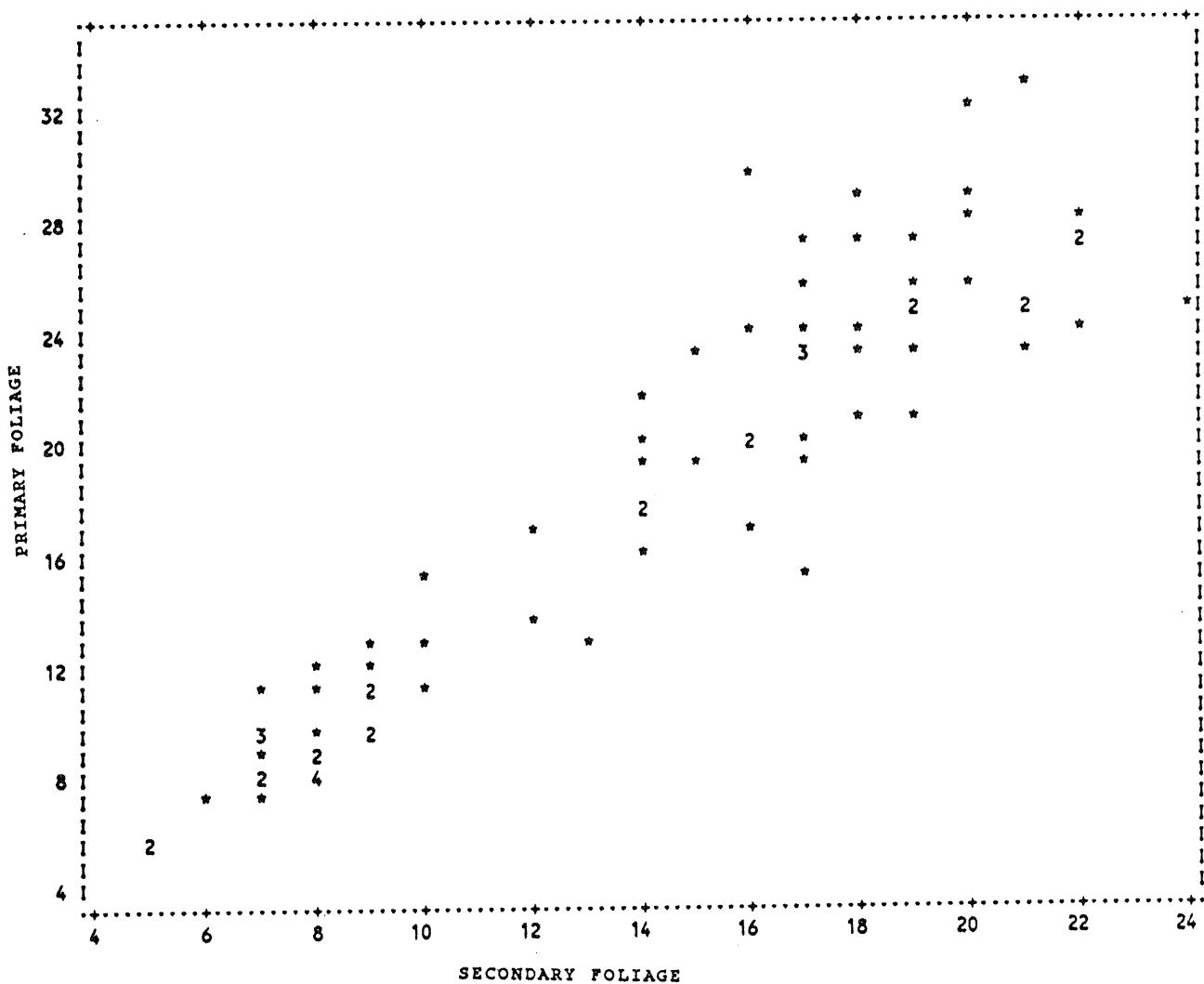
$r = 0.60$

MAGNESIUM - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FIELD STAFF



$r = 0.41$

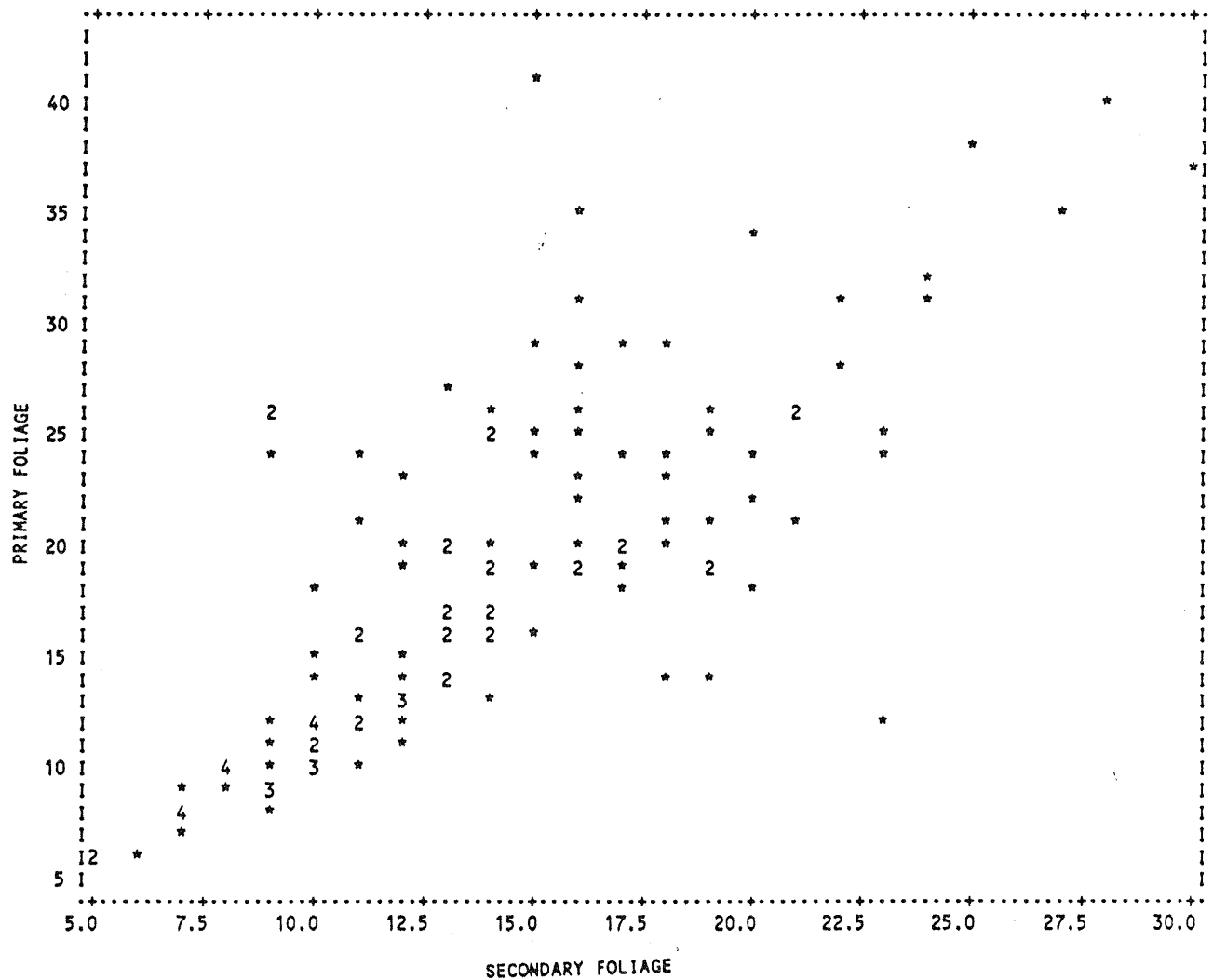
BORON • PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FRI STAFF



$r = 0.84$

APPENDIX 2 continued.

BORON - PRIMARY FOLIAGE vs SECONDARY FOLIAGE. COLLECTED BY FIELD STAFF



$$r = 0.42$$

APPENDIX 3

Table of Results

A = Primary foliage
B = Secondary foliage

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.	
Nelson: Motueka											
A F15842	1.322	.073	.702	.147	.093	25	111	22	4.9	299	1A
A F15843	1.433	.093	1.005	.162	.117	20	149	35	5.6	301	2A
A F15844	1.151	.071	.528	.145	.120	21	179	23	4.7	303	3A
A F15845	1.175	.068	.365	.116	.100	20	98	18	4.5	305	4A
A F15846	1.659	.094	.971	.173	.121	32	118	36	6.3	307	5A
B F15847	1.274	.068	.653	.123	.083	23	108	26	5.1	300	1A
B F15848	1.246	.082	.829	.131	.086	17	113	27	4.9	302	2A
B F15849	1.013	.065	.473	.128	.095	19	148	27	4.4	304	3A
B F15850	1.100	.062	.328	.100	.084	18	89	18	4.0	306	4A
B F15851	1.409	.079	.823	.149	.105	24	99	29	5.8	308	5A
Nelson: Golden Downs											
A F15852	1.330	.126	.876	.241	.121	20	382	37	4.2	309	1B
A F15853	1.348	.145	1.076	.261	.130	16	280	44	4.0	311	2B
A F15854	1.473	.178	.890	.233	.141	19	417	49	4.0	313	3B
A F15855	1.532	.264	1.160	.262	.124	14	205	39	4.8	315	4B
A F15856	1.530	.193	.969	.255	.149	13	263	39	4.7	317	5B
B F15857	1.134	.110	.818	.220	.109	16	382	43	4.0	310	1B
B F15858	1.201	.124	.963	.193	.115	14	196	29	3.9	312	2B
B F15859	1.217	.136	.890	.175	.110	15	345	31	4.0	314	3B
B F15860	1.430	.153	.956	.182	.110	10	172	30	4.2	316	4B
B F15861	1.312	.215	1.071	.208	.115	12	148	40	4.4	318	5B
Northland: Shenstones Farm											
A F15862	1.768	.182	.649	.201	.275	40	112		2.1	Y19	1A
A F15863	2.004	.103	.835	.089	.193	31	35		2.1	Y20	2A
A F15864	1.731	.181	.579	.191	.293	41	65		5.4	Y23	3A
A F15865	1.707	.161	.469	.152	.337	24	49		2.1	Y24	4A
A F15866	1.504	.144	.483	.160	.234	31	31		3.8	Y27	5A
B F15867	1.381	.133	.679	.187	.273	28	104		2.1	Y19	1A
B F15868	1.771	.093	.808	.206	.228	22	108		2.5	Y20	2A
B F15869	1.270	.124	.661	.224	.180	15	59		3.9	Y23	3A
B F15870	1.282	.110	.692	.233	.220	23	76		2.5	Y24	4A
B F15871	1.415	.133	.553	.247	.224	24	76		3.7	Y27	5A
Northland: Te Hapua											
A F15555	1.762	.104	.904	.106	.092	29	183	24	6.5	822	B1
A F15556	1.574	.082	.908	.114	.116	19	98	18	5.4	834	B2
A F15557	1.428	.116	.995	.111	.130	24	126	23	5.1	835	B3
A F15558	1.557	.112	1.037	.145	.146	19	325	47	5.8	838	B4
A F15559	1.679	.075	.727	.254	.140	14	758	38	3.4	8310	B5
B F15560	1.542	.088	.804	.102	.091	17	199	22	5.0	822	B1
B F15561	1.349	.079	.628	.132	.120	12	129	18	4.4	834	B2
B F15562	1.151	.088	.743	.130	.116	18	147	28	3.7	835	B3

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.	
B F15563	1.515	.094	.794	.122	.119	14	222	32	4.9	838	B4
B F15564	1.368	.088	.901	.161	.133	19	661	31	4.2	8310	B5

Westland: Kanieri

A F15901	1.229	.172	.810	.166	.109	19	437		3.4		1
A F15902	1.231	.160	.803	.186	.092	16	294		3.3		2
A F15903	1.228	.136	.494	.200	.104	12	369		3.3		3
A F15904	1.425	.206	.942	.249	.099	17	245		3.9		4
A F15905	1.056	.096	.985	.113	.081	13	54		3.2		5
B F15906	1.042	.147	.784	.139	.080	14	381		2.9		1
B F15907	1.088	.150	.793	.168	.089	15	311		3.0		2
B F15908	1.167	.126	.469	.186	.091	10	329		3.2		3
B F15909	1.279	.182	.950	.203	.098	14	181		3.9		4
B F15910	.949	.088	.888	.082	.063	12	39		2.9		5

Westland: Paparoa

A F15911	1.028	.134	.493	.206	.128	20	68		3.1		1
A F15912	1.233	.169	.636	.201	.136	26	66		3.3		2
A F15913	1.275	.079	.533	.101	.096	11	28		4.5		3
A F15914	1.454	.125	.745	.142	.116	25	65		4.2		4
A F15915	1.206	.119	.425	.133	.125	20	39		3.3		5
B F15916	1.094	.126	.491	.181	.112	17	60		3.0		1
B F15917	1.06	.142	.621	.168	.109	21	50		3.1		2
B F15918	1.242	.117	.685	.108	.081	19	43		3.9		3
B F15919	1.148	.073	.483	.082	.076	9	24		4.6		4
B F15920	1.145	.115	.398	.138	.113	13	39		3.4		5

Southland: Tokotiki

A F15134	1.532	.162	.931	.252	.144	12	223	46	5.0		1
A F15135	1.512	.134	.918	.153	.096	8	193	27	4.4		2
A F15136	1.423	.149	.946	.177	.116	10	214	36	4.0		3
A F15137	1.519	.152	.708	.236	.107	10	229	30	4.1		4
A F15138	1.458	.136	.617	.228	.118	9	234	23	4.2		5
B F15139	1.402	.135	.859	.212	.119	12	201	37	4.7		1
B F15140	1.427	.127	.893	.124	.084	9	147	29	4.6		2
B F15141	1.381	.138	.931	.154	.102	10	194	28	4.2		3
B F15142	1.482	.141	.692	.209	.095	10	193	26	4.1		4
B F15143	1.40	.133	.613	.199	.103	9	190	26	4.1		5

Southland: Waipori

A F15144	1.947	.221	.930	.341	.134	22	1226		3.7		1
A F15145	1.892	.196	.993	.277	.097	18	1151		3.9		2
A F15146	1.866	.240	1.202	.147	.099	19	772		4.7		3
A F15147	1.737	.171	.702	.422	.103	21	1760		3.6		4
A F15148	1.655	.206	1.091	.223	.083	19	801		3.9		5
B F15149	1.859	.196	.970	.261	.108	20	1159		3.5		1
B F15150	1.786	.175	.970	.261	.090	20	1159		3.7		2
B F15151	1.675	.222	1.216	.146	.098	21	742		4.5		3
B F15152	1.656	.156	.715	.369	.100	19	1439		3.4		4
B F15153	1.580	.198	1.086	.155	.072	17	556		3.8		5

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
Southland: Glen Dhu										
A F14902	1.580	.252	1.178	.122	.084	17	205		3.9	1 cpt 16
B F14903	1.420	.230	1.194	.100	.070	14	171		3.5	1 cpt 16
A F14904	1.640	.199	.879	.125	.082	6	336		5.1	2 cpt 18
B F14905	1.490	.186	.901	.105	.074	6	290		5.4	2 cpt 18
A F14906	1.600	.227	1.094	.125	.104	13	155		4.4	3 cpt 13
B F14907	1.470	.214	1.108	.105	.082	11	128		4.0	3 cpt 13
A F14908	1.860	.278	1.153	.177	.122	19	310		6.1	4 cpt 13
A F14909	1.740	.258	1.150	.153	.101	19	287		5.4	4 cpt 13
B F14910	1.660	.233	1.208	.122	.096	13	231		4.6	5 cpt 16
A F14911	1.520	.224	1.217	.107	.076	14	209		4.7	5 cpt 16
B F14912	1.770	.211	.965	.139	.105	10	220		5.2	1 cpt 11
A F14913	1.500	.186	.916	.112	.084	9	195		4.7	1 cpt 11
B F14914	1.740	.204	.927	.178	.118	10	217		4.7	2 cpt 11
A F14915	1.570	.192	.925	.151	.105	10	192		4.8	2 cpt 11
B F14916	1.760	.200	1.108	.192	.109	9	176		4.4	3 cpt 20
A F14917	1.650	.177	1.057	.170	.091	8	143		4.4	3 cpt 20
Southland: Berwick										
A F14918	1.420	.259	1.113	.111	.081	11	136		4.1	4 cpt 117
B F14919	1.340	.242	1.111	.090	.070	12	93		3.9	4 cpt 117
Canterbury: Waimate										
A F15597	1.684	.175	.826	.171	.120	13	356		4.6	A1
A F15598	1.566	.158	.797	.160	.098	12	367		4.8	A2
A F15599	1.556	.144	.707	.188	.093	14	323		4.8	A3
A F15600	1.606	.166	.774	.188	.111	10	267		4.3	A4
A F15601	1.645	.172	.815	.155	.114	9	246		4.6	A5
B F15602	1.524	.144	.742	.136	.094	12	314		4.6	A1
B F15603	1.544	.153	.790	.168	.095	11	308		4.7	A2
B F15604	1.526	.140	.618	.170	.088	13	260		4.5	A3
B F15605	1.521	.148	.665	.168	.097	11	201		4.3	A4
B F15606	1.539	.165	.839	.138	.094	9	240		4.7	A5
A F15607	1.735	.179	.945	.243	.121	8	64		4.6	B1
A F15608	1.662	.195	1.061	.239	.111	8	59		4.5	B2
A F15609	1.708	.206	.943	.282	.130	10	212		5.0	B3
A F15610	1.684	.232	1.151	.190	.094	12	114		4.2	B4
A F15611	1.559	.161	.926	.266	.109	6	149		4.4	B5
B F15612	1.572	.143	.935	.252	.117	7	71		4.0	B1
B F15613	1.485	.151	.987	.226	.098	7	54		3.9	B2
B F15614	1.594	.164	.932	.235	.115	8	166		4.7	B3
B F15615	1.545	.187	1.078	.163	.075	9	97		3.7	B4
B F15616	1.400	.140	.855	.233	.099	5	140		4.1	B5
Northland: Pipiwai										
A F15618	1.566	.210	.804	.109	.156	35	251		14.5	2A
A F15619	1.778	.145	1.133	.120	.138	31	179		14.1	3A
A F15620	1.688	.185	.925	.138	.170	31	223		12.9	4A
A F15621	1.850	.283	1.207	.144	.146	26	160		7.3	5A
B F15622	1.547	.146	.686	.228	.115	11	339		4.2	1A
B F15623	1.509	.123	.662	.116	.082	12	240		4.8	2A
B F15624	1.606	.102	.771	.097	.065	12	126		5.6	3A

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
B F15625	1.459	.106	.866	.159	.098	10	232		4.5	4A
B F15626	1.616	.127	.846	.140	.077	11	138		4.5	5A

Northland: Rakautao

A F15628	1.365	.176	1.017	.142	.134	25	51	4.4		2B
A F15629	1.622	.217	1.110	.137	.128	26	45	5.1		3B
A F15630	1.515	.216	.973	.085	.122	31	32	5.2		4B
A F15631	1.498	.186	.926	.176	.150	25	47	4.8		5B
B F15632	1.469	.115	.775	.327	.125	15	106	3.8		1B
B F15633	1.183	.139	.846	.172	.114	14	60	3.6		2B
B F15634	1.240	.139	.995	.193	.118	14	48	3.8		3B
B F15635	1.298	.142	.788	.142	.120	16	52	3.6		4B
B F15636	1.369	.137	.852	.202	.122	15	56	3.7		5B

Canterbury: Ashley

A F14960	1.551	.200	.906	.163	.233	16	161	4.7		1
A F14961	1.545	.190	.863	.137	.114	20	236	5.1		2
A F14962	1.494	.182	.839	.133	.123	14	186	5.0		3
A F14963	1.504	.124	.684	.141	.128	8	274	5.3		4
A F14964	1.515	.153	.904	.223	.139	12	381	4.7		5
B F14965	1.349	.135	1.004	.146	.080	11	122	4.1		1
B F14966	1.290	.126	.909	.114	.089	13	163	3.9		2
B F14967	1.337	.134	.869	.135	.113	13	189	4.7		3
B F14968	1.271	.104	.712	.140	.114	7	243	5.4		4
B F14969	1.316	.133	.872	.208	.133	10	394	4.3		5
A F14970	1.343	.149	.873	.137	.143	10	100	3.7		1
A F14971	1.499	.193	.943	.159	.145	12	112	3.9		2
A F14972	1.313	.165	.867	.147	.153	9	37	3.6		3
A F14973	1.337	.173	.841	.114	.125	11	73	3.7		4
A F14974	1.395	.193	.843	.090	.105	11	82	3.8		5
B F14975	1.235	.127	.830	.114	.127	8	73	3.5		1
B F14976	1.353	.159	.994	.145	.126	10	103	3.8		2
B F14977	1.173	.139	.885	.126	.123	9	73	3.1		3
B F14978	1.327	.151	.827	.105	.110	10	70	3.4		4
B F14979	1.303	.168	.820	.068	.089	10	58	3.5		5

NZFP: Waiomio

A F15301	1.481	.188	1.119	.131	.120	26	174	9.7		A1
A F15302	1.414	.169	.845	.114	.115	18	111	6.0		A2
A F15303	1.459	.164	1.075	.135	.127	21	303	9.2		A3
A F15304	1.345	.191	.648	.093	.130	24	34	4.5		A4
A F15305	1.623	.171	.882	.082	.129	24	31	11.0		A5
B F15306	1.301	.105	.874	.212	.102	9	235	3.9		A1
B F15307	1.205	.100	.619	.143	.087	10	108	3.3		A2
B F15308	1.219	.091	.827	.200	.090	11	394	4.0		A3
B F15309	1.173	.104	.441	.135	.099	9	35	3.1		A4
B F15310	1.284	.084	.512	.122	.091	11	33	4.0		A5

Rotorua: Tauhara

A F15243	1.772	.196	1.017	.211	.068	8	144	42	4.5	3u
A F15244	1.716	.195	1.037	.197	.072	9	130	44	4.9	3p
A F15245	1.579	.198	.871	.184	.082	8	136	42	3.7	5u

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
A F15246	1.720	.208	.924	.230	.092	8	150	51	4.6	5p
A F15247	1.778	.224	.943	.250	.084	7	141	50	4.9	6u
A F15248	1.665	.175	.908	.226	.098	8	126	45	4.6	6p
A F15249	1.854	.191	.882	.267	.095	9	151	49	4.7	7u
A F15250	1.716	.194	1.074	.265	.073	10	163	45	4.4	7p
A F15251	1.712	.185	.998	.260	.082	8	183	64	4.9	8u
A F15252	1.622	.218	1.040	.234	.076	9	139	47	5.1	8p
A F15253	1.863	.223	1.079	.186	.069	8	125	50	5.1	11u
A F15254	1.689	.188	1.034	.310	.095	11	179	45	4.6	11p
A F15255	1.651	.238	.927	.218	.108	12	154	47	4.1	12u
A F15256	1.875	.274	1.061	.247	.084	11	150	47	5.3	12p
A F15257	1.653	.198	.967	.244	.113	10	161	50	4.7	14u
A F15258	1.853	.237	1.111	.204	.080	10	124	41	5.4	14p
B F14984	1.520	.175	1.032	.166	.063	8	115	41	4.0	3u
B F14985	1.420	.159	.910	.134	.054	8	95	36	4.3	3p
B F14988	1.390	.168	.784	.153	.074	8	113	50	3.0	5u
B F14989	1.490	.182	.955	.212	.085	8	133	48	4.5	5p
B F14990	1.490	.191	.977	.200	.070	7	131	49	4.5	6u
B F14991	1.460	.163	.903	.173	.097	7	94	44	4.2	6p
B F14992	1.590	.156	.836	.183	.074	7	105	41	4.2	7u
B F14993	1.470	.155	.957	.186	.064	9	108	38	4.1	7p
B F14994	1.530	.197	.933	.192	.070	8	135	49	4.5	8u
B F14995	1.520	.183	1.013	.183	.065	8	101	49	4.8	8p
B F15000	1.570	.189	1.193	.172	.063	7	92	40	4.7	11u
B F15001	1.430	.156	.918	.212	.068	9	118	45	4.3	11p
B F15002	1.430	.192	.886	.138	.079	8	95	30	3.6	12u
B F15003	1.640	.208	.980	.151	.063	7	87	28	4.5	12p
B F15006	1.520	.163	.896	.175	.068	7	107	30	4.2	14u
B F15007	1.490	.187	.971	.135	.069	7	77	25	4.5	14p

Auckland: Waipoua

A F15697	1.782	.203	1.026	.122	.117	23	60		4.7	cpt 15
B F15698	1.423	.165	.916	.210	.127	16	58		4.2	cpt 15
A F15699	1.580	.144	.923	.178	.151	35	148		5.4	cpt 17
B F15700	1.320	.095	.762	.280	.244	27	141		4.1	cpt 17
A F15701	1.913	.118	.787	.280	.182	38	242		4.2	cpt 7
B F15702	1.761	.103	.661	.469	.133	25	322		3.1	cpt 7
A F15703	1.748	.122	.762	.201	.202	22	224		5.3	cpt 7
B F15704	1.444	.099	.595	.294	.161	16	253		3.9	cpt 7

Auckland: Otangaroa

A F15705	1.735	.138	1.251	.140	.135	26	154		6.1	cpt 102
B F15706	1.558	.119	1.086	.229	.076	21	257		3.9	cpt 102
A F15707	1.459	.115	1.202	.197	.136	29	160		5.2	cpt 102
B F15708	1.478	.102	.995	.250	.108	15	191		4.2	cpt 102
A F15709	1.441	.112	1.361	.109	.085	16	104		4.9	cpt 2
B F15710	1.383	.102	1.186	.136	.087	14	124		4.4	cpt 2
A F15711	1.493	.108	1.374	.128	.117	28	102		5.0	cpt 1
B F15712	1.282	.094	1.082	.118	.083	16	66		3.9	cpt 1

Auckland: Waitangi

A F15713	1.659	.095	1.100	.232	.159	24	196		4.2	cpt 7
B F15714	1.569	.085	.834	.372	.107	20	299		3.8	cpt 7
A F15715	1.780	.127	1.006	.203	.200	34	144		4.3	cpt 29

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
B F15716	1.346	.155	.930	.351	.141	20	201		3.4	cpt 29
A F15717	1.500	.223	1.055	.148	.203	35	165		4.3	cpt 3
B F15718	1.383	.177	.856	.341	.131	16	379		3.1	cpt 3

Auckland: Glenbervie

A F15719	1.633	.145	1.056	.109	.114	23	419		5.4	cpt 3
B F15720	1.254	.111	.695	.139	.096	12	482		4.0	cpt 3
A F15721	1.424	.146	1.073	.154	.088	20	728		5.3	cpt 4
B F15722	1.098	.131	.926	.092	.062	14	633		4.6	cpt 4
A F15723	1.703	.203	.799	.218	.125	23	959		4.8	cpt 7
B F15724	1.207	.139	.665	.215	.132	18	916		4.3	cpt 7
A F15725	1.727	.236	.740	.157	.083	16	446		4.4	cpt 18
B F15726	1.448	.141	.658	.222	.103	13	501		4.5	cpt 18
A F15727	1.702	.171	.654	.078	.099	27	86		3.1	cpt 37
B F15728	1.400	.129	.567	.210	.196	13	181		3.2	cpt 37
A F15729	1.756	.185	.667	.167	.083	17	296		4.3	cpt 18
B F15730	1.499	.146	.520	.191	.091	13	349		4.2	cpt 18
A F15731	1.942	.220	.853	.152	.097	12	285		4.9	cpt 9
B F15732	1.586	.125	.626	.286	.122	10	413		4.2	cpt 9
A F15733	1.462	.133	.867	.135	.080	16	618		5.4	cpt 11
B F15734	1.281	.130	.744	.149	.082	13	652		4.5	cpt 11
A F15735	1.704	.197	1.357	.134	.095	24	343		5.7	cpt 12
B F15736	1.605	.104	.961	.172	.092	17	438		4.8	cpt 12
A F15737	1.737	.117	.890	.162	.088	19	280		5.1	cpt 13
B F15738	1.421	.099	.713	.212	.096	16	335		4.3	cpt 13

Rotorua: Kaingaroa

A F14820	1.568	.169	.738	.162	.118	6	323	44	5.3	1
A F14821	1.667	.175	.801	.174	.112	23	488	52	5.8	2
A F14822	1.716	.165	.819	.121	.062	11	396	44	5.7	3
A F14823	1.685	.171	.857	.192	.113	6	419	53	5.5	4
A F14824	1.699	.163	.895	.130	.054	14	444	43	6.5	5
A F14825	1.657	.181	.904	.120	.088	21	352	49	5.9	6
B F14746	1.492	.153	.778	.117	.092	5	246	42	5.1	1
B F14747	1.460	.167	.774	.118	.092	17	316	43	5.6	2
B F14748	1.592	.155	.832	.114	.058	10	344	37	5.5	3
B F14749	1.566	.155	.811	.132	.091	5	286	42	5.2	4
B F14750	1.561	.161	.888	.096	.047	12	317	41	6.2	5
B F14751	1.513	.172	.997	.095	.064	18	272	47	5.5	6

Northland: Maromaku

A F14034	1.606	.138	.986	.250	.174	18	69	27	4.0	1
A F14035	1.558	.147	1.055	.242	.190	19	114	38	4.2	2
A F14036	1.590	.136	1.043	.223	.129	19	98	33	3.8	3
A F14037	1.707	.158	.937	.279	.168	18	133	40	4.6	4
A F14038	1.804	.104	1.126	.141	.117	17	70	34	4.8	5
A F14039	1.365	.086	.786	.119	.120	11	87	32	4.0	6
A F14040	1.521	.134	1.077	.285	.178	23	222	46	4.4	7
A F14041	1.662	.158	1.106	.177	.180	22	166	36	3.5	8
A F14042	1.579	.161	.993	.214	.154	20	181	42	4.5	9
A F14043	1.931	.079	.868	.099	.122	23	80	32	4.3	10
A F14044	1.456	.138	1.146	.228	.180	26	122	41	4.7	11
A F14045	1.713	.163	.997	.213	.256	20	76	37	4.5	12
B F13407	1.317	.133	.897	.164	.131	14	49	26	3.6	1

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
B F13408	1.330	.113	.923	.155	.135	14	106	28	3.7	2
B F13409	1.315	.114	.942	.144	.113	15	66	25	3.0	3
B F13410	1.461	.148	.951	.180	.143	14	79	29	3.7	4
B F13411	1.438	.099	1.067	.109	.130	12	57	32	4.0	5
B F13412	1.244	.079	.723	.113	.093	9	80	27	3.3	6
B F13413	1.296	.138	1.085	.177	.129	17	166	35	3.8	7
B F13414	1.186	.114	1.046	.160	.133	14	83	33	2.9	8
B F13415	1.421	.123	1.007	.149	.122	17	121	34	4.2	9
B F13416	1.614	.078	.877	.083	.084	15	65	27	3.9	10
B F13417	1.277	.126	.999	.131	.117	17	120	25	3.8	11
B F13418	1.318	.130	1.007	.153	.113	14	48	27	3.4	12

Northland: Te Kao

A F14087	1.654	.150	.457	.238	.231	28	100	42	2.2	1
A F14088	1.618	.163	.769	.227	.219	33	77	22	3.0	2
A F14089	1.655	.155	.815	.225	.186	26	42	23	2.4	3
A F14090	1.442	.095	.452	.183	.214	20	48	12	2.2	4
A F14091	1.440	.113	.352	.213	.244	29	43	25	1.4	5
A F14092	1.511	.178	.768	.222	.196	28	40	25	2.8	6
A F14093	1.574	.176	.793	.287	.259	26	54	22	2.7	7
A F14094	1.593	.114	.576	.178	.328	24	49	16	1.2	8
A F14095	1.549	.189	.770	.222	.210	25	37	24	2.7	9
A F14096	1.546	.123	.405	.178	.187	24	58	19	1.5	10
A F14097	1.626	.141	.466	.205	.211	32	55	21	1.1	11
A F14098	1.515	.153	.616	.214	.230	29	54	18	2.6	12
A F14099	1.980	.154	.792	.209	.215	25	50	20	1.6	13
A F14100	1.499	.095	.682	.156	.184	20	43	12	2.9	14
A F14101	1.576	.130	.758	.220	.169	30	155	19	3.1	15
A F14102	1.772	.097	.838	.213	.299	27	70	13	1.8	16
A F14103	1.510	.170	.636	.233	.305	23	50	21	2.5	17
A F14104	1.502	.123	.697	.231	.270	27	59	22	1.9	18
B F13389	1.348	.126	.642	.147	.181	20	47	19	1.7	1
B F13390	1.302	.164	.397	.145	.183	21	60	27	2.4	2
B F13391	1.399	.127	.706	.133	.139	20	29	15	2.0	3
B F13392	1.253	.091	.517	.108	.181	16	31	11	1.5	4
B F13393	1.247	.110	.344	.126	.167	20	25	14	1.1	5
B F13394	1.396	.147	.756	.150	.173	22	26	21	2.4	6
B F13395	1.333	.147	.692	.168	.169	19	39	19	2.2	7
B F13396	1.443	.113	.594	.144	.168	18	35	16	.8	8
B F13397	1.399	.160	.762	.180	.147	21	29	20	2.4	9
B F13398	1.318	.125	.387	.154	.198	16	41	19	1.1	10
B F13399	1.382	.132	.428	.133	.172	20	33	18	.8	11
B F13400	1.331	.148	.594	.142	.158	18	30	17	2.0	12
B F13401	1.687	.095	.662	.109	.175	21	29	10	1.2	13
B F13402	1.269	.123	.734	.157	.183	16	118	16	2.4	14
B F13403	1.414	.145	.817	.150	.142	16	33	16	2.7	15
B F13404	1.624	.089	.826	.144	.165	22	51	12	1.3	16
B F13405	1.332	.156	.596	.192	.173	21	44	18	2.2	17
B F13406	1.332	.128	.644	.135	.150	18	42	19	1.8	18

Auckland: Woodhill

A F14896	1.499	.367	.769	.135	.179	37	135	65	4.9	
B F14897	1.283	.259	.867	.142	.187	30	132	64	4.2	
A F14898	1.578	.382	.998	.146	.213	26	219	43	4.6	
B F14899	1.441	.163	.880	.180	.190	16	124	37	3.8	

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
A F14900	1.341	.142	.883	.184	.186	12	205	46	3.8	
B F14901	1.362	.136	.821	.187	.169	11	207	47	3.9	
Auckland: Riverhead										
A F14740	1.326	.125	.641	.181	.133	18	69	21	3.8	
B F14741	1.234	.166	.517	.431	.196	29	300	25	3.4	
A F14742	1.038	.233	1.399	.098	.136	23	412	33	3.5	cpt 17/4
B F14743	1.420	.287	1.070	.129	.096	12	668	27	2.8	cpt 17/4
A F14744	1.399	.251	1.336	.077	.107	19	91	31	6.1	cpt 20/4
B F14745	1.575	.388	1.450	.095	.154	26	134	52	7.6	cpt 20/4
Nelson: Baigents Cpt 54										
A F14876	1.719	.177	.712	.253	.135	28	484	41	4.4	1
A F14877	1.759	.173	1.125	.259	.135	10	112	52	4.8	2
A F14878	1.573	.172	1.057	.258	.136	21	167	44	4.4	3
A F14879	1.848	.193	.865	.274	.146	25	258	42	6.0	4
A F14880	2.037	.202	.847	.300	.145	15	146	36	5.2	5
B F14881	1.731	.165	.722	.229	.108	22	389	36	4.2	1
B F14882	1.620	.151	1.051	.174	.081	8	76	38	4.4	2
B F14883	1.523	.156	1.017	.203	.106	18	142	39	4.2	3
B F14884	1.659	.163	.803	.193	.084	16	152	32	5.2	4
B F14885	1.533	.140	.697	.228	.103	10	90	27	4.5	4
Cpt 102										
A F14886	1.335	.108	.629	.153	.119	10	427	41	4.1	1
A F14887	1.234	.099	.658	.161	.117	6	699	41	3.6	2
A F14888	1.254	.089	.375	.135	.122	7	265	32	3.6	3
A F14889	1.168	.104	.815	.165	.115	8	146	31	3.4	4
A F14890	1.352	.107	.865	.148	.109	9	616	44	3.9	5
A F14891	1.252	.102	.590	.133	.104	8	377	40	3.8	1
B F14892	1.152	.091	.617	.143	.100	5	617	40	3.4	2
B F14893	1.161	.088	.359	.130	.116	7	249	31	3.4	3
B F14894	1.052	.097	.751	.156	.106	7	134	30	3.3	4
B F14895	1.220	.096	.742	.120	.093	7	492	41	3.5	5
Northland: Omahuta										
A F14046	2.035	.153	.430	.208	.132	25	69	42	4.3	1
A F14047	2.032	.145	.701	.114	.105	24	32	45	2.4	2
A F14048	2.032	.069	.778	.074	.077	15	41	53	4.6	3
A F14049	1.805	.119	.589	.111	.092	23	44	36	3.6	4
A F14050	1.284	.142	.815	.191	.114	23	74	50	3.0	5
A F14051	1.230	.115	.824	.144	.098	21	53	61	3.3	6
A F14052	1.993	.147	.668	.135	.094	17	156	35	2.5	7
A F14053	1.120	.197	.196	.216	.141	10	93	28	1.7	8
A F14054	2.288	.179	.191	.173	.130	10	100	18	1.1	9
A F14055	1.330	.084	.782	.102	.089	16	43	48	3.1	10
A F14056	1.925	.133	.678	.181	.121	25	63	24	3.2	11
A F14057	1.673	.132	.728	.106	.071	27	38	35	3.1	12
A F14058	2.167	.163	.205	.205	.139	23	66	34	3.5	13
A F14059	1.889	.146	.540	.216	.107	24	158	40	2.6	14
A F14060	1.580	.120	.616	.133	.091	13	92	38	2.1	15
A F14061	2.021	.144	.695	.148	.103	25	54	41	3.3	16

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
A F14062	1.418	.163	.421	.190	.129	13	64	34	3.4	17
A F14063	1.982	.119	.609	.105	.086	7	31	35	3.6	18
A F14064	1.383	.191	.570	.164	.115	11	71	25	3.1	19
A F14065	1.203	.099	.505	.144	.101	12	198	41	3.2	30
A F14428	1.921	.118	.712	.155	.099	27	77	46	3.4	21
A F14429	1.392	.153	.270	.252	.135	15	117	30	2.3	23
A F14430	1.954	.140	.631	.212	.122	27	73	40	3.5	26
A F14431	1.430	.121	.372	.185	.135	10	122	41	3.2	27
A F14432	2.204	.060	.534	.082	.074	19	38	60	4.6	28
A F14433	1.314	.159	.372	.161	.118	13	104	32	2.9	29
B F13874	1.766	.156	.486	.142	.108	24	48	38	3.5	1
B F13876	1.830	.127	.722	.106	.108	22	27	42	2.4	2
B F13878	1.948	.063	.721	.069	.069	17	35	51	4.6	3
B F13880	1.623	.102	.564	.070	.070	18	26	29	3.1	4
B F13882	1.087	.131	.769	.142	.101	19	53	46	2.6	5
B F13884	1.114	.102	.720	.128	.093	19	43	57	3.0	6
B F13886	1.890	.149	.675	.103	.086	16	114	30	2.4	7
B F13888	1.095	.202	.182	.206	.142	9	87	25	.3	8
B F13890	2.298	.182	.185	.161	.132	7	93	18	.4	9
B F13892	1.206	.078	.706	.071	.153	14	31	40	3.1	10
B F13894	1.682	.123	.633	.140	.118	19	52	21	2.9	11
B F13896	1.718	.117	.676	.085	.063	19	31	29	2.9	12
B F13898	2.044	.150	.193	.130	.108	17	41	25	2.9	13
B F13900	1.704	.136	.514	.179	.093	17	115	34	2.2	14
B F13902	1.386	.109	.559	.098	.079	13	61	34	2.0	15
B F13904	1.705	.130	.690	.118	.086	19	40	38	2.8	16
B F13906	1.185	.157	.353	.137	.111	10	48	31	3.2	17
B F13908	1.553	.112	.623	.078	.071	6	23	29	3.4	18
B F13910	1.229	.162	.514	.130	.095	8	58	21	2.7	19
B F13914	1.600	.121	.673	.113	.071	17	48	37	3.2	21
B F13918	1.259	.157	.472	.150	.112	10	66	50	2.7	23
B F13924	1.698	.140	.678	.167	.093	22	49	35	3.2	26
B F13926	1.300	.129	.339	.154	.103	8	104	36	3.0	27
B F13928	2.207	.061	.551	.077	.067	17	32	57	4.3	28
B F13930	1.228	.144	.322	.135	.096	9	80	26	2.9	29
B F13932	1.049	.099	.456	.105	.087	9	146	37	3.2	30

Auckland: Whangapoua

A R07984	1.580	.110	.893	.096	.200	25	128	46	4.5	cpt 11
B R07985	1.350	.103	.939	.063	.101	14	69	21	3.3	cpt 11
A R07986	1.500	.109	.786	.214	.119	17	194	43	4.2	cpt 84
B R07987	1.540	.096	.599	.281	.085	13	231	33	3.8	cpt 84
A R07988	1.820	.207	1.241	.183	.098	13	219	40	4.7	cpt 114
B R07989	1.340	.168	.545	.300	.080		284	24		cpt 114

Auckland: Tairua

A R07990	1.280	.139	.954	.228	.172	18	185	55	4.7	cpt 249
B R07991	1.060	.127	1.140	.155	.175	17	129	51	4.4	cpt 249
A R07992	1.430	.106	.922	.231	.147	19	747	70	4.3	cpt 111
B R07993	1.290	.093	.731	.324	.139	16	889	73	3.7	cpt 111
A R07994	1.100	.103	1.000	.148	.122	15	436	49	6.7	cpt 127
B R07995	1.020	.097	.914	.101	.099	12	297	39	5.7	cpt 127

Log no.	N	P	K	Ca	Mg	B	Mn	Zn	Cu	Your no.
Auckland: Maramarua										
Cpt 17										
A R08005	1.120	.151	.852	.235	.114	12	785	33	3.0	1
B R08006	.926	.145	.862	.230	.105		720	33		1
A R08007	1.160	.167	1.000	.167	.103	26	415	30	3.0	2
B R08008	.930	.128	1.086	.339	.129	9	898	30	2.1	2
A R08009	1.340	.158	1.074	.205	.093	14	742	21	2.8	3
B R08010	1.190	.154	1.081	.219	.076	12	799	19	2.4	3
Cpt 35										
A R08011	1.340	.200	1.139	.195	.141	14	915	48	4.5	4
B R08012	1.050	.148	1.061	.146	.092	18	702	39	3.4	4
A R08013	1.110	.201	1.082	.127	.128	16	505	38	4.7	5
B R08014	.971	.153	.928	.117	.087	11	445	28	3.0	5
A R08015	1.610	.229	1.090	.175	.131	20	572	41	4.9	6
B R08016	1.470	.162	.942	.194	.106	12	650	36	3.4	6