

Plant parasitic nematodes occurrence and genetic diversity of banana cultivars grown in Tanzania

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Supplementary Table 1. The 159 banana samples collected from the surveyed areas across Tanzania.

Variety code	Variety local Name	Genome*	Region	District	Longitude	Latitude	Altitude (m.a.s.l)*	Cluster
BT1	Nkundi	AAA	Kagera	Muleba	31.55585	-2.02817	1313	A
BT2	Katuli	AAA	Ruvuma	Songea Rural	35.42898	-10.6272	1077	A
BT3	Kimulia	AAB	Kilimanjaro	Siha	37.10357	-3.23227	1126	A
BT4	KM 5	AAA	Kagera	Bukoba	31.73517	-1.45178	1305	A
BT5	Mzuzu mweupe	AAB	Zanzibar	Unguja-West	39.23753	-6.02991	42	B
BT6	Bukoba	AAA	Ruvuma	Namtumbo	35.85804	-10.5669	955	A
BT7	Bukoba	AAA	Ruvuma	Songea	35.73076	-10.5971	1125	A
BT8	Bukoba	AAA	Ruvuma	Mbinga	34.92807	-10.9452	1456	A
BT9	Koroboi	ABB	Zanzibar	Unguja-Central	39.32647	-6.10905	33	B
BT10	Bokoboko	ABB	Ruvuma	Namtumbo	35.73137	-10.4599	1074	B
BT11	Mshare	AA	Kilimanjaro	Moshi Rural	37.40795	-3.3043	1332	B
BT12	Yangambi	AAA	Zanzibar	Unguja-West	39.25844	-6.08685	90	A
BT13	Gross-Michel	AAA	Kagera	Muleba	31.70763	-1.7532	1337	A
BT14	Mkojosi	ABB	Kilimanjaro	Rombo	37.8089	-3.22929	1474	B
BT15	Mzuzu	AAB	Ruvuma	Namtumbo	35.64533	-10.6456	1080	B
BT16	Msinyora	AAB	Zanzibar	Unguja-North	39.26069	-5.87557	21	A
BT17	Kisukari-pombe	ABB	Kilimanjaro	Siha	37.10357	-3.23227	1126	B
BT18	Kanana	AB	Kagera	Karagwe	31.15658	-1.56998	1603	B
BT19	Uganda	AAA	Arusha	Arumeru	36.8368	-3.30922	1617	A
BT20	Ntama	AAA	Kagera	Karagwe	31.15658	-1.56998	1603	A
BT21	Bukoba	AAA	Zanzibar	Unguja-North	39.30477	-5.94741	76	A
BT22	Kimalindi	AAA	Kilimanjaro	Rombo Alleni	37.8089	-3.22929	1474	A
BT23	Mtwike	AAA	Mbeya	Kyela	33.90585	-9.47759	502	A
BT24	Bokoboko	ABB	Ruvuma	Mbinga	35.47525	-10.6791	1014	B
BT25	Kijakazi	AAA	Zanzibar	Unguja-Central	39.3307	-6.04148	46	A
BT26	Mtwike	AAA	Zanzibar	-Unguja-North	39.32964	-5.9818	52	A
BT27	Kisukari	AAB	Arusha	Arumeru	36.82551	-3.40751	1223	A
BT28	Kanana	AB	Kagera	Muleba	31.6463	-1.90091	1273	B
BT29	Bokoboko	ABB	Pemba	Wete	34.7472	-5.21131	1	B
BT30	Kisukari/kambani	AB	Mbeya	Ileje	33.44693	-9.4872	1474	B
BT31	Broken	ABB	Mbeya	Ileje	33.07299	-9.41963	1359	B
BT32	Kisukari/kambani	AB	Ruvuma	Songea Rural	35.47525	-10.6791	1014	B
BT33	Mkojozi	ABB	Kilimanjaro	Moshi Rural	37.48781	-3.29109	1527	B
BT34	Mzuzu	AAB	Ruvuma	Mbinga	34.91887	-11.0808	1557	B
BT35	Mtwike	AAA	Kagera	Misenyi	31.5715	-1.22324	1148	A

BT36	Nchoncho	AAA	Kagera	Karagwe	31.20928	-1.51961	1259	A
BT37	FHIA 17	AAAA	Mbeya	Rungwe	33.44693	-9.4872	1474	A
BT38	Kisukari/kambani	AB	Mbeya	Kyela	33.95196	-9.42038	550	B
BT39	Paji	AAA	Zanzibar	Unguja-South	39.49019	-6.4178	29	B
BT40	Mzuzu mwekundu	AAB	Zanzibar	Unguja-South	39.43463	-6.29817	7	B
BT41	Mshare	AA	Kilimanjaro	Hai	37.23847	-3.1779	1775	B
BT42	Ndyali	AAA	Mbeya	Rungwe	33.53476	-9.13776	1240	A
BT43	Mlali	AAA	Zanzibar	Jondeni	39.38925	-5.20885	34.7472	A
BT44	Pukusa	AAA	Pemba	Wete	39.45971	-5.06479	32.3088	B
BT45	Mtwike	AAA	Zanzibar	Unguja-West	39.23753	-6.02991	42	A
BT46	Mtwike	AAA	Pemba	Mkoani	39.43501	-5.21131	34.7472	A
BT47	Mzuzu mweupe	AAB	Zanzibar	Unguja-South	39.43463	-6.29817	7	B
BT48	Kisukari	AAB	Pemba	Chakechake	39.43209	-5.16434	17.3736	A
BT49	Nshakara	AAA	Kagera	Muleba	31.54947	-1.79161	1571	A
BT50	FHIA 23	AAAA	Kagera	Misenyi	31.5715	-1.22324	1148	A
BT51	Matoke	AAA	Kilimanjaro	Rombo	37.8089	-3.22929	1474	A
BT52	Mpatatani	AA	Mbeya	Rungwe	33.87359	-9.62467	496	A
BT53	Toki/Mzuzu	AAB	Mbeya	Ileje	33.44693	-9.4872	1474	B
BT54	Mbwazirume	AAA	Kagera	Karagwe	31.25611	-1.60763	1207	A
BT55	Pukusa	AAA	Zanzibar	Unguja-North	39.25272	-5.96826	46	A
BT56	Gurutu	ABB	Mbeya	Kyela	33.87032	-9.48062	519	B
BT57	Nchoncho	AAA	Kagera	Bukoba	31.76301	-1.26627	1308	A
BT58	Mshare	AA	Arusha	Arumeru	36.81633	-3.36902	1237	A
BT59	FHIA 17	AAAA	Kagera	Muleba	31.6463	-1.90091	1273	A
BT60	Paaz	AAA	Arusha	Arumeru	36.80711	-3.37243	1255	A
BT61	Bukoba	AAA	Ruvuma	Songea Rural	35.42898	-10.6272	1077	A
BT62	Kisukari/kambani	AB	Ruvuma	Songea	35.69946	-10.7031	1260	B
BT63	William	AAA	Arusha	Arumeru	36.80711	-3.37243	1255	A
BT64	Kaporota	AAA	Ruvuma	Mbinga	35.09035	-10.784	1027	A
BT65	FHIA 17	AAAA	Kagera	Bukoba	31.73517	-1.45178	1305	A
BT66	Gross-Michel	AAA	Kagera	Bukoba	31.42447	-1.56665	1207	A
BT67	Ndyali	AAA	Mbeya	Ileje	33.44693	-9.4872	1474	A
BT68	Mzuzu mweupe	AAB	Zanzibar	Unguja-North	39.30477	-5.94741	76	B
BT69	Kijakazi	AAA	Pemba	Micheweni	39.44266	-4.59249	42.0624	A
BT70	Pukusa	AAA	Pemba	Chakechake	39.45137	-5.1373	36.2712	A
BT71	Kisukari	AAB	Pemba	Micheweni	39.44266	-4.59249	42.0624	A
BT72	Pukusa	AAA	Pemba	Mkoani	39.43501	-5.21131	34.7472	A
BT73	Kijakazi	AAA	Pemba	Chakechake	39.43501	-5.21133	35.3568	A
BT74	Mshare Mnyenyele	AA	Kilimanjaro	Rombo	37.6069	-3.2292	1474	A
BT75	Mkonozi	ABB	Arusha	Arumeru	36.8368	-3.30922	1617	B
BT76	Mwamunyila	AAA	Mbeya	Ileje	33.44693	-9.4872	1474	A
BT77	Mtwike	AAA	Pemba	Wete	39.42588	-5.01043	75.5904	A
BT78	Ntaliho	AAA	Kagera	Muleba	31.55585	-2.02817	1313	A
BT79	Uganda	AAA	Mbeya	Ileje	33.54446	-9.50187	1151	A

BT80	Bokoboko	ABB	Ruvuma	Songea Rural	35.47525	-10.6791	1014	B
BT81	Mwamunyila	AAA	Mbeya	Rungwe	33.6922	-9.45292	856	A
BT82	Mwamunyila	AAA	Mbeya	Mbinga	34.9923	-10.9549	1358	A
BT83	Kimalindi	AAA	Kilimanjaro	Hai	37.23847	-3.1779	1775	A
BT84	Mzuzu mwekundu	AAB	Zanzibar	Unguja-West	39.27657	-6.1961	7	B
BT85	Bukoba	AAA	Zanzibar	Unguja-Central	39.32647	-6.10905	33	A
BT86	Ndishi	AAA	Kilimanjaro	Rombo	39.30477	-5.94741	76	A
BT87	Gurutu/Zambia	ABB	Mbeya	Rungwe	33.91688	-9.69632	477	B
BT88	Pukusa	AAA	Zanzibar	Unguja-Central	39.32647	-6.10905	33	A
BT89	Ng'ombe	AAA	Kilimanjaro	Rombo	37.6069	-3.2292	1474	B
BT90	Mkono wa tembo	AAB	Pemba	Chakechake	39.45137	-5.1373	36.2712	A
BT91	Kimalindi	AAA	Arusha	Arumeru	36.81633	-3.36902	1237	A
BT92	Ng'ombe	AAA	Kilimanjaro	Moshi Rural	37.42745	-3.30335	1110	B
BT93	Uganda	AAA	Mbeya	Rungwe	33.58928	-9.22023	1360	A
BT94	Msinyore	AAB	Zanzibar	Unguja-South	39.52605	-6.44342	24	A
BT95	Malindi	AAA	Arusha	Arumeru	36.81633	-3.36902	1237	A
BT96	Mtwike	AAA	Mbeya	Rungwe	33.95565	-9.62253	486	A
BT97	Kiguruwe	AAA	Pemba	Chakechake	39.45137	-5.1373	36.2712	A
BT98	Nshakara	AAA	Kagera	Karagwe	31.15658	-1.56998	1603	A
BT99	Mtwike	AAA	Pemba	Micheweni	39.44266	-4.59249	42.0624	A
BT100	Harare	ABB	Mbeya	Kyela	33.676	-9.53799	581	B
BT101	Toki/Mzuzu	AAB	Mbeya	Kyela	33.676	-9.53799	581	B
BT102	Malindi	AAA	Kilimanjaro	Rombo	37.6069	-3.2292	1474	A
BT103	Ntobe	AAA	Kagera	Karagwe	31.02621	-1.66093	1310	A
BT104	Nyoya	AAA	Kagera	Muleba	31.70763	-1.7532	1337	A
BT105	Koroboi	ABB	Pemba	Wete	39.42588	-5.01043	75.5904	B
BT106	Mzuzu	AAB	Pemba	Micheweni	39.48733	-5.0064	18.288	B
BT107	Mkono mmoja	AAB	Zanzibar	Unguja-South	39.43463	-6.29817	7	A
BT108	Bukoba	AAA	Arusha	Arumeru	36.78019	-3.348	1462	A
BT109	Enjubo	AAA	Kagera	Misenyi	31.38339	-1.21735	1161	A
BT110	Koroboi	ABB	Zanzibar	Unguja-West	39.2956	-6.30283	1	B
BT111	Kachako	ABB	Zanzibar	Unguja-West	39.25844	-6.08685	90	B
BT112	Pukusa	AAA	Pemba	Micheweni	39.48733	-5.0064	18.288	A
BT113	Msinyore	AAB	Zanzibar	Unguja-Central	39.32647	-6.10905	33	A
BT114	Mzuzu mwekundu	AAB	Zanzibar	Unguja-West	39.23753	-6.02991	42	B
BT115	Mtwike	AAA	Zanzibar	Unguja-West	39.23968	-6.22563	12	A
BT116	Mzuzu mweupe	AAB	Zanzibar	Unguja-West	39.23968	-6.22563	12	B
BT117	Bokoboko	ABB	Pemba	Chakechake	34.91887	-11.0808	1557	B
BT118	Kisukari/kambani	AB	Ruvuma	Namtumbo	35.85804	-10.5669	955	B
BT119	Kaguma	ABB	Kagera	Misenyi	31.38339	-1.21735	1161	B
BT120	Mtwike	AAA	Pemba	Chakechake	39.43209	-5.16434	17.3736	A
BT121	FHIA 23	AAAA	Kagera	Muleba	31.69942	-1.55851	1266	A
BT122	Zanzibar	AAA	Mbeya	Rungwe	33.91688	-9.69632	477	A
BT123	Mshale mwekundu	AA	Zanzibar	Unguja-North	39.32964	-5.9818	52	B

BT124	Mkono wa tembo	AAB	Pemba	Wete	39.45971	-5.06479	32.3088	A
BT125	Nshakara	AAA	Kagera	Kyerwa	30.66657	-1.09086	1325	A
BT126	Mshale	AA	Mbeya	Rungwe	33.53476	-9.13776	1463	A
BT127	Bukoba	AAA	Pemba	Mkoani	39.3307	-6.04148	46	A
BT128	Koroboi	ABB	Pemba	Micheweni	39.48733	-5.0064	18.288	B
BT129	Malindi	AAA	Kilimanjaro	Hai	37.22831	-3.2798	1085	A
BT130	Mshare	AA	Kilimanjaro	Siha	37.10357	-3.23227	1126	B
BT131	Mtwike	AAA	Zanzibar	Unguja-North	39.30477	-5.94741	76	A
BT132	Kisukari/kambani	AB	Mbeya	Rungwe	33.82747	-9.41328	565	B
BT133	Israeli	AAAA	Arusha	Arumeru	36.74404	-3.54093	1620	A
BT134	Mtwike	AAA	Zanzibar	Unguja-South	39.28712	-6.13695	46	A
BT135	Pukusa	AAA	Zanzibar	Unguja-South	39.49019	-6.4178	29	A
BT136	Kivuvu	ABB	Kagera	Karagwe	31.02621	-1.66093	1310	B
BT137	Jamaika	AAA	Kilimanjaro	Moshi Rural	37.54177	-3.33168	1084	A
BT138	Malindi	AAA	Mbeya	Rungwe	33.65972	-9.32437	1250	A
BT139	Msinyore	AAB	Pemba	Wete	39.52605	-6.44342	24	A
BT140	Mtwike	AAA	Zanzibar	Unguja-Central	39.3287	-6.17895	17	A
BT141	Ntobe	AAA	Kagera	Misenyi	31.41353	-1.0159	1185	A
BT142	Mzuzu	AAB	Pemba	Mkoani	39.43501	-5.21131	34.7472	B
BT143	Nshasha	AAA	Kagera	Bukoba	31.42447	-1.56665	1207	A
BT144	Toki/Mzuzu	AAB	Mbeya	Rungwe	33.65972	-9.32437	1250	B
BT145	Mkojozi	ABB	Kilimanjaro	Moshi Rural	37.38852	-3.32615	983	B
BT146	Mshare- Mnyenyere	AA	Kilimanjaro	Hai	37.1922	-3.24543	1248	B
BT147	Harare	ABB	Mbeya	Rungwe	33.82747	-9.41328	565	B
BT148	Nshasha	AAA	Kagera	Muleba	31.70763	-1.7532	1337	A
BT149	Mkono wa tembo	AAB	Pemba	Mkoani	39.38925	-5.20885	34.7472	A
BT150	Katuli	AAA	Ruvuma	Mbinga	34.91887	-11.0808	1557	A
BT151	Ali Hassan Mwinyi	ABB	Pemba	Wete	39.48733	-5.0064	18	B
BT152	Mshale (Mchare)	AA	Ruvuma	Mbinga	34.92807	-10.9452	1456	A
BT153	Jamaika	AAA	Arusha	Arumeru	36.80711	-3.37243	1255	A
BT154	Pukusa	AAA	Zanzibar	Unguja-West	39.27657	-6.1961	7	A
BT155	Malindi	AAA	Ruvuma	Namtumbo	35.73137	-10.4599	1074	A
BT156	Mshale	AA	Ruvuma	Namtumbo	35.64533	-10.6456	1080	B
BT157	Mshale	AA	Kagera	Bukoba	31.76301	-1.26627	1308	A
BT158	Nyoya	AAA	Kagera	Bukoba	31.42447	-1.56665	1207	A
BT159	Mtwike	AAA	Zanzibar	Unguja-South	39.52605	-6.44342	24	A

*Genome of banana is sourced from Karamura, (1999)

Supplementary Table 2. Analysis of nematode populations collected from different major banana growing regions of Tanzania. **A:** Mean number of nematode counts per 100 ml of nematode suspension, \pm standard error (SE). **B:** One-way analysis of variance (ANOVA) table for means of nematode population counts per 100 ml of nematode suspension, **C:** Post-hoc Tukey's Honestly Significant Difference (HSD) test for differences between means and significance of pairwise comparison for different nematode species in different banana variety clusters. Differences indicated by * are significant at the $P < 0.05$ level and ** are significant at the $P < 0.01$ level; NS indicates non-significance.

A

	<i>Rhadopholus similis</i>	<i>Pratylenchus goodeyi</i>	<i>Pratylenchus coffeae</i>
Cluster A	275.41 \pm 87.4	587.96 \pm 73.8	53.05 \pm 14
Cluster B	216.3 \pm 47.1	414.2 \pm 79.4	50.2 \pm 13.4
Cluster A+B	244.15 \pm 48.6	496.16 \pm 54.8	51.5 \pm 9.7

B

	Source of Variation	SS	df	MS	F	P-value	F crit
Cluster A	Between Groups	10831363.3	2	5415682	16.30435	2.47316E-07	3.036524
	Within Groups	73739922.9	222	332161.8			
	Total	84571286.1	224				
Cluster B	Between Groups	5578708.17	2	2789354	11.20012	2.1996E-05	3.032065
	Within Groups	62012628.3	249	249046.7			
	Total	67591336.4	251				
Cluster A+B	Between Groups	15808879.5	2	7904440	27.33065	5.83975E-12	3.014746
	Within Groups	137088004	474	289215.2			
	Total	152896883	476				

C

	GA	SA	CA	GB	SB	CB
GA	0	5.04**	8.63**	2.88 NS	6.16**	8.92**
SA		0	3.59 NS	2.30 NS	0.98 NS	3.73 NS
CA			0	5.99**	2.71 NS	0.05 NS
GB				0	3.38 NS	6.21**
SB					0	2.83 NS
CB						0

Value labeled: A= cluster A, B= cluster B, G= *Pratylenchus goodeyi*, S= *Rhadopholus similis* and C= *Pratylenchus coffeae*.