

Appendices

APPENDIX I

Morphological characteristics of coconut inflorescence

Sl. No.	Diameter of inflorescence, mm	Length of inflorescence, mm	Length of spikelet, mm	Width of spikelet, mm	Number of flowers per spikelet	Pollen diameter, μm	
						Polar diameter (Length)	Equatorial diameter (Width)
1.	700	734	393	17.1	293	63.122	25.289
2.	713	810	372	21.5	305	65.035	25.418
3.	658	683	365	19.8	263	62.909	28.0369
4.	574	582	378	19.4	274	58.36	26.366
5.	612	648	400	23.2	237	64.458	29.72
6.	664	757	412	21.5	252	62.692	28.529
7.	723	756	347	22.3	265	61.696	27.193
8.	746	832	285	23.8	272	59.632	25.717
9.	692	706	315	24.3	241	59.745	27.599
10.	780	845	276	20.6	254	65.156	29.111

APPENDIX II – (A)

Number of pollens collected by ring electrode (Ø 50 mm) at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	29450	24330	15680	0	0	0	0	0	0
		29860	25129	14840	0	0	0	0	0	0
		30240	25375	15360	0	0	0	0	0	0
	5	38760	31860	26329	12280	0	0	0	0	0
		38425	32240	26112	11632	0	0	0	0	0
		39130	32680	26950	12950	0	0	0	0	0
	6	94795	82350	37124	31525	23921	0	0	0	0
		93125	82976	36823	32029	23375	0	0	0	0
		95400	83200	37400	32725	24480	0	0	0	0
	7	116640	109200	76274	59955	51735	10015	0	0	0
		117170	99752	75840	58296	52016	9654	0	0	0
		117970	108200	75330	60550	52675	9870	0	0	0
	8	-1	147960	100066	76901	60908	15220	0	0	0
		-1	145520	99264	76276	61457	16018	0	0	0
		-1	153260	101660	77350	62100	16420	0	0	0
	9	-1	317469	218842	84688	76352	24018	0	0	0
		-1	316525	217652	85008	75632	23686	0	0	0
		-1	318240	219760	85400	76275	24320	0	0	0

10	-1	399268	355183	101267	90068	29120	14572	0	0	0
	-1	395150	348692	99867	89458	31200	15210	0	0	0
	-1	402480	355180	109200	90115	30510	15680	0	0	0
11	-1	-1	417649	116460	100054	41520	33020	7410	0	0
	-1	-1	416536	109366	99235	41882	32681	6825	0	0
	-1	-1	416000	116200	106480	42620	34125	7840	0	0
12	-1	-1	425560	213040	210213	82302	61763	31114	0	0
	-1	-1	424132	208678	203400	82547	60790	30870	0	0
	-1	-1	424840	211400	209920	83840	61380	31200	0	0
13	-1	-1	445250	225750	211864	84860	73560	35547	5112	2016
	-1	-1	444862	226173	210892	84025	73125	35004	4964	2237
	-1	-1	446770	227500	213000	85200	74100	35640	5360	2362
14	-1	-1	425668	275518	266938	105565	79035	40512	14120	9864
	-1	-1	443595	276247	267023	100842	79924	41320	14323	9923
	-1	-1	444000	277550	267890	107145	80400	41020	14880	10360
15	-1	-1	-1	279682	269024	107562	91368	45014	35642	35020
	-1	-1	-1	281254	268842	107856	90765	44681	35890	34547
	-1	-1	-1	280350	269280	108160	91140	45570	36176	35420

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX II – (B)

Number of pollens collected by cylindrical electrode at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	35840	25920	16275	0	0	0	0	0	0
		35275	24654	17125	0	0	0	0	0	0
		34520	25375	16400	0	0	0	0	0	0
	5	47465	33210	28665	18125	5280	0	0	0	0
		48124	32500	27510	17540	4865	0	0	0	0
		48600	33916	28125	16866	5023	0	0	0	0
	6	96412	84480	45280	34945	26510	0	0	0	0
		95023	85125	44160	33256	25165	0	0	0	0
		95760	83025	44670	33026	25682	0	0	0	0
	7	-1	110580	80640	65540	58520	10200	0	0	0
		-1	111523	78898	64358	57650	9682	0	0	0
		-1	108786	79160	63389	57160	9740	0	0	0
	8	-1	159375	126160	83025	65070	23680	0	0	0
		-1	158864	125850	82685	64465	22140	0	0	0
		-1	158086	125089	82156	63912	22760	0	0	0
	9	-1	324720	283400	105985	91300	37760	16400	0	0
		-1	323688	284638	108394	90208	37045	15528	0	0
		-1	323197	283760	99367	90898	36190	14968	0	0

10	-1	-1	411440	130175	120890	44640	39160	0	0	0
	-1	-1	410862	128765	118658	43280	38156	0	0	0
	-1	-1	407645	129686	119225	44160	37809	0	0	0
11	-1	-1	433680	161460	152205	65280	52140	9540	0	0
	-1	-1	432335	160578	151454	64142	51240	8784	0	0
	-1	-1	432867	161025	153120	63120	50928	8142	0	0
12	-1	-1	-1	242190	214445	105560	63120	18360	3780	0
	-1	-1	-1	241654	213765	98408	62280	17140	3023	0
	-1	-1	-1	240869	213004	100016	64048	18689	2876	0
13	-1	-1	-1	292240	249095	120640	81840	43560	11440	3180
	-1	-1	-1	291352	248116	119840	80600	42632	12183	2765
	-1	-1	-1	290984	248322	117536	81266	42018	10772	3065
14	-1	-1	-1	-1	289140	211660	95700	67320	34760	21680
	-1	-1	-1	-1	291060	212006	94060	66760	35216	20048
	-1	-1	-1	-1	287640	210440	94842	66028	33620	21143
15	-1	-1	-1	-1	-1	242250	109800	95550	59620	40600
	-1	-1	-1	-1	-1	240980	113225	94600	58423	41212
	-1	-1	-1	-1	-1	241625	98565	93865	60640	38628

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX II – (C)

Number of pollens collected by spherical electrode at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	20340	9890	0	0	0	0	0	0	0
		19120	9565	0	0	0	0	0	0	0
		21120	8780	0	0	0	0	0	0	0
	5	33040	12100	0	0	0	0	0	0	0
		32364	11470	0	0	0	0	0	0	0
		31014	12740	0	0	0	0	0	0	0
	6	39690	20700	6750	0	0	0	0	0	0
		38612	19870	5920	0	0	0	0	0	0
		39118	21190	6119	0	0	0	0	0	0
	7	51600	36450	16720	6110	0	0	0	0	0
		50145	35675	15100	5270	0	0	0	0	0
		52192	36140	15930	5874	0	0	0	0	0
	8	-1	57300	28600	12740	3780	0	0	0	0
		-1	56640	27190	11906	3120	0	0	0	0
		-1	57014	28160	10964	3856	0	0	0	0
	9	-1	60800	36120	21190	16100	4290	0	0	0
		-1	59424	35820	20205	15470	3565	0	0	0
		-1	60144	34622	21454	14366	3780	0	0	0

10	-1	60140	36675	31330	29640	9870	0	0	0	0
	-1	61260	37700	30745	27862	8236	0	0	0	0
	-1	62322	37150	32830	30015	7450	0	0	0	0
11	-1	61380	44100	40320	33820	12430	0	0	0	0
	-1	62440	43023	39272	32724	11630	0	0	0	0
	-1	63020	44690	41136	32845	12008	0	0	0	0
12	-1	80280	57150	52110	43700	15470	2080	0	0	0
	-1	78070	56065	51832	42742	16200	1655	0	0	0
	-1	79420	56745	50864	43708	14668	1163	0	0	0
13	-1	108375	80550	66960	52440	22050	11360	0	0	0
	-1	110565	78625	65244	51156	21745	10860	0	0	0
	-1	106462	81280	65130	53120	20869	12016	0	0	0
14	-1	-1	110565	91800	78570	24450	18080	1760	0	0
	-1	-1	111664	90566	77150	23382	16832	1108	0	0
	-1	-1	98752	90872	78025	25190	17230	1365	0	0
15	-1	-1	163185	139920	97520	27450	22160	2720	0	0
	-1	-1	161890	137520	96409	26647	21126	2026	0	0
	-1	-1	162160	137860	97783	26018	20628	1989	0	0

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX II – (D)

Number of pollens collected by conical electrode at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	20820	9800	0	0	0	0	0	0	0
		21142	8612	0	0	0	0	0	0	0
		19750	9026	0	0	0	0	0	0	0
	5	-1	13110	2700	0	0	0	0	0	0
		-1	12025	2021	0	0	0	0	0	0
		-1	12856	1996	0	0	0	0	0	0
	6	-1	23575	10080	4400	0	0	0	0	0
		-1	24240	9760	3860	0	0	0	0	0
		-1	22080	11023	4128	0	0	0	0	0
	7	-1	39000	23650	10205	0	0	0	0	0
		-1	37682	22080	11186	0	0	0	0	0
		-1	38126	22698	9762	0	0	0	0	0
	8	-1	-1	30580	23650	5600	0	0	0	0
		-1	-1	31114	22674	4846	0	0	0	0
		-1	-1	29270	21875	5120	0	0	0	0
	9	-1	-1	29240	27240	16340	6120	0	0	0
		-1	-1	27270	26874	15452	5882	0	0	0
		-1	-1	30080	25800	16853	6050	0	0	0

10	-1	-1	-1	33360	26875	25080	0	0	0	0
	-1	-1	-1	32870	25280	24200	0	0	0	0
	-1	-1	-1	33066	26150	25672	0	0	0	0
11	-1	-1	-1	38870	35800	27060	0	0	0	0
	-1	-1	-1	39124	34420	26285	0	0	0	0
	-1	-1	-1	37580	35012	25635	0	0	0	0
12	-1	-1	-1	-1	42200	32850	2550	0	0	0
	-1	-1	-1	-1	41118	31452	2452	0	0	0
	-1	-1	-1	-1	41866	31070	2770	0	0	0
13	-1	-1	-1	-1	52440	35465	22880	1890	0	0
	-1	-1	-1	-1	51632	34486	21792	1664	0	0
	-1	-1	-1	-1	51966	35008	20812	1812	0	0
14	-1	-1	-1	-1	-1	38280	27520	2970	825	0
	-1	-1	-1	-1	-1	39465	28454	2452	638	0
	-1	-1	-1	-1	-1	37535	26125	3125	715	0
15	-1	-1	-1	-1	-1	-1	-1	5340	1720	0
	-1	-1	-1	-1	-1	-1	-1	4756	1562	0
	-1	-1	-1	-1	-1	-1	-1	5130	1448	0

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX III – (A)

Number of pollens collected by R4 electrode (Ø 40 mm) at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	32330	26640	15875	0	0	0	0	0	0
		31180	26025	14436	0	0	0	0	0	0
		32964	26934	15038	0	0	0	0	0	0
	5	40260	37740	21945	10080	0	0	0	0	0
		41016	37086	20176	9886	0	0	0	0	0
		39975	36693	20968	11230	0	0	0	0	0
	6	88830	82175	30845	24120	18880	0	0	0	0
		88135	81758	29647	23860	17860	0	0	0	0
		87536	83041	31068	24846	16482	0	0	0	0
	7	100580	93610	56160	37260	29280	7020	0	0	0
		110024	91745	56898	36544	28634	6853	0	0	0
		99798	92369	55410	35756	30012	7118	0	0	0
	8	-1	123120	98280	48780	34240	12240	0	0	0
		-1	122520	97642	47163	33468	11352	0	0	0
		-1	123862	98742	47968	35089	12087	0	0	0
	9	-1	241300	198740	62640	53120	20500	0	0	0
		-1	240765	197869	61322	52681	19765	0	0	0
		-1	242038	198012	60879	51745	21320	0	0	0

10	-1	373670	240960	88740	79600	27000	10810	0	0	0
	-1	374110	241374	86486	80260	26250	9820	0	0	0
	-1	372348	239214	87380	79010	25890	11240	0	0	0
11	-1	-1	303170	106740	98700	36480	27120	5175	0	0
	-1	-1	310040	99440	94500	34970	24480	4136	0	0
	-1	-1	309683	103100	96350	33470	25690	6120	0	0
12	-1	-1	370350	160930	113740	80500	54510	20960	0	0
	-1	-1	356400	158360	111255	78680	53210	19030	0	0
	-1	-1	349650	157640	110540	77430	51860	22235	0	0
13	-1	-1	407490	206360	176720	82560	65780	29340	2560	1680
	-1	-1	410545	212060	174370	83790	63245	30890	1850	1260
	-1	-1	398642	200040	177460	80990	66148	27985	2112	1996
14	-1	-1	418770	225400	191290	95520	72220	36360	10880	8880
	-1	-1	416850	226400	190435	93480	71660	35489	11285	7540
	-1	-1	415940	213640	188890	94640	70640	34590	9735	8015
15	-1	-1	-1	248305	220430	100320	84180	40110	29760	16065
	-1	-1	-1	246610	222410	110086	82160	38740	27490	15630
	-1	-1	-1	245724	221160	99645	83045	39542	28160	14220

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX III – (B)

Number of pollens collected by R6 electrode (Ø 60 mm) at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	27200	24320	12690	0	0	0	0	0	0
		26580	26470	13500	0	0	0	0	0	0
		28120	25540	11750	0	0	0	0	0	0
	5	37980	31740	25680	10250	0	0	0	0	0
		38940	30700	23840	9760	0	0	0	0	0
		35112	32250	26180	11380	0	0	0	0	0
	6	97110	92345	40320	33580	23040	0	0	0	0
		98350	90480	41860	34650	22170	0	0	0	0
		95840	91385	42940	32184	24680	0	0	0	0
	7	140140	135270	102060	67480	56780	9030	0	0	0
		141522	134680	110860	66800	55420	8864	0	0	0
		139956	133900	99735	65222	54300	9680	0	0	0
	8	-1	189375	152100	108640	81840	23320	0	0	0
		-1	190212	151460	110870	80285	21460	0	0	0
		-1	188650	152952	99480	82300	22860	0	0	0
	9	-1	324715	263320	153680	107300	43840	0	0	0
		-1	322980	262480	152770	110500	42150	0	0	0
		-1	323655	263970	154230	99765	44360	0	0	0

10	-1	436990	399525	242090	184005	52895	19240	0	0	0
	-1	435200	398025	240960	183640	51900	17500	0	0	0
	-1	436640	401200	241650	182500	50840	18320	0	0	0
11	-1	-1	420420	296350	196320	77970	38760	8160	0	0
	-1	-1	421520	294160	195600	76800	39460	7650	0	0
	-1	-1	422100	295410	194420	75540	37400	7890	0	0
12	-1	-1	434140	307700	242060	93760	70680	37820	0	0
	-1	-1	433650	310850	241880	94550	71480	36640	0	0
	-1	-1	432870	298650	240666	95788	72540	35200	0	0
13	-1	-1	452550	321950	269280	102080	87075	50220	7560	4860
	-1	-1	450350	323650	268460	99865	86460	51300	7012	5070
	-1	-1	451866	322950	267750	110350	85340	52440	6534	4250
14	-1	-1	454480	331350	289440	193230	98010	60140	19780	14280
	-1	-1	455130	330740	290220	192290	97680	58700	18300	13170
	-1	-1	454090	332050	288640	191680	96540	61930	20024	14980
15	-1	-1	-1	343570	306720	200680	110565	72220	50160	39245
	-1	-1	-1	342720	299435	210650	100820	73950	49745	38750
	-1	-1	-1	341800	311240	199490	112680	71535	51230	40180

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX III – (C)

Number of pollens collected by R7 electrode (Ø 70 mm) at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	21280	16740	10360	0	0	0	0	0	0
		20360	15470	9860	0	0	0	0	0	0
		22500	14820	11240	0	0	0	0	0	0
	5	34560	28830	21390	8060	0	0	0	0	0
		33880	27910	22620	7670	0	0	0	0	0
		31420	26700	20300	8230	0	0	0	0	0
	6	94710	85500	37820	29110	18200	0	0	0	0
		93470	86590	36200	30330	17650	0	0	0	0
		92510	84977	38170	27456	19180	0	0	0	0
	7	132840	121360	91120	51240	49210	8640	0	0	0
		133660	122545	90500	53360	48460	9060	0	0	0
		131989	120760	92650	50980	50440	7450	0	0	0
	8	-1	183260	146370	92460	79360	21440	0	0	0
		-1	182940	145270	93360	80890	22680	0	0	0
		-1	184625	144360	90540	77155	20450	0	0	0
	9	-1	320675	258540	146320	101920	42315	0	0	0
		-1	322500	260050	145520	111302	43510	0	0	0
		-1	319070	257060	144300	106830	41652	0	0	0

10	-1	435610	380560	236160	183675	53040	21460	0	0	0
	-1	433250	378654	235135	182460	53980	22740	0	0	0
	-1	434330	381560	234410	183050	52200	20864	0	0	0
11	-1	-1	421260	296020	197620	80135	39780	8990	0	0
	-1	-1	420989	298100	196700	82125	38240	9120	0	0
	-1	-1	421036	295360	195200	78690	40380	8130	0	0
12	-1	-1	438340	310780	245025	104880	73630	39150	0	0
	-1	-1	436866	311550	246880	111660	75200	37980	0	0
	-1	-1	439250	308766	244089	99780	71060	40260	0	0
13	-1	-1	438980	322140	270720	113620	89280	57120	8170	5590
	-1	-1	440820	320890	272600	112400	90240	58690	8990	4980
	-1	-1	436860	323180	269080	115320	88680	56530	7760	5880
14	-1	-1	439075	326430	286810	123610	95940	58050	17820	11160
	-1	-1	440065	324650	285220	125550	96110	57780	16650	13200
	-1	-1	437690	327730	288600	122320	94360	59270	18360	10670
15	-1	-1	-1	327275	289600	143310	97760	59670	20540	14040
	-1	-1	-1	325700	287450	145620	98660	60540	22200	13580
	-1	-1	-1	328080	290040	142280	96450	57990	19060	14880

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX III – (D)

Number of pollens collected by R8 electrode (Ø 80 mm) at varying applied voltage and electrode-pollen distances

	Electrode-pollen distance (mm)									
	10	20	30	40	50	60	70	80	90	100
Applied Voltage (kV)	4	19840	14880	9920	0	0	0	0	0	0
		21320	15560	8680	0	0	0	0	0	0
		18640	13320	9030	0	0	0	0	0	0
	5	33840	24180	19530	7980	0	0	0	0	0
		32600	26050	20790	8360	0	0	0	0	0
		31500	23280	18650	7580	0	0	0	0	0
	6	90390	55800	34320	28380	14760	0	0	0	0
		92720	53260	35440	27060	15400	0	0	0	0
		89090	56130	33620	29130	13780	0	0	0	0
	7	127440	98040	84500	49020	42840	7585	0	0	0
		128650	97330	85690	50660	40990	8140	0	0	0
		126460	99080	83260	47870	43620	7280	0	0	0
	8	-1	142080	115150	91200	67440	19710	0	0	0
		-1	143800	116860	92300	69380	17740	0	0	0
		-1	141890	113960	90770	65560	20900	0	0	0
	9	-1	278190	156560	140535	92160	37120	0	0	0
		-1	276240	166830	142350	93880	35880	0	0	0
		-1	279980	143760	139320	91440	38890	0	0	0

10	-1	317295	304920	229320	122670	51840	19380	0	0	0
	-1	316655	310630	230260	123440	50540	20755	0	0	0
	-1	317960	299678	228470	121860	52380	18540	0	0	0
11	-1	-1	389060	293260	182770	78540	33320	8775	0	0
	-1	-1	390260	291680	180065	77550	32485	7650	0	0
	-1	-1	388340	292580	183370	79160	33990	9005	0	0
12	-1	-1	420420	316840	246510	110760	76570	41195	0	0
	-1	-1	421150	315310	245620	111200	74420	40240	0	0
	-1	-1	420010	317780	246990	108690	76080	42665	0	0
13	-1	-1	423500	318120	275975	116800	91760	57620	9240	6570
	-1	-1	424195	317635	275020	115370	92250	56820	9965	5780
	-1	-1	422610	319650	274890	117440	90800	57095	8640	6120
14	-1	-1	433615	322140	279930	120120	92125	58220	17420	11040
	-1	-1	434550	323350	278860	121360	91460	59120	16440	10860
	-1	-1	432670	321460	277200	119670	93360	57845	18230	12580
15	-1	-1	-1	324480	284580	128340	95735	58960	19440	14980
	-1	-1	-1	323770	283690	127350	96080	59340	20660	13870
	-1	-1	-1	322480	284990	129040	94470	57745	18340	15060

-1 indicates burning 'effect'; 0 indicated 'no effect'

APPENDIX - IV

Number of pollens collected during field testing, under optimized operating conditions

Geometry	Voltage, kV	Electrode-pollen distance, mm	Pollen count
R6	10	30	108405
			120320
			144840
R6	10	40	62220
			75020
			60060
R6	10	50	33370
			36720
			43680
R7	10	30	100045
			113520
			94600
R7	10	50	31720
			33320
			37400
R7	11	40	96585
			91250
			81620

APPENDIX - V**Number of pollens collected under peak collection operating conditions**

Geometry	Voltage, kV	Electrode-pollen distance, mm	Pollen count
R4	13	30	114380
			120960
			107040
R4	14	30	134320
			145360
			152880
R5	11	30	92020
			98940
			91840
R5	12	30	109440
			120840
			98470
R5	13	30	122740
			145860
			147060
R5	14	30	164690
			179340
			168725
R6	10	20	135780
			117670
			145700
R6	11	30	111860
			101010
			118560
R6	12	30	131440
			128440
			134640
R6	13	30	188680
			159280
			195480

R6	14	30	212425
			199920
			203970
R7	10	20	129720
			116480
			124640
R7	11	30	127920
			106720
			114660
R7	12	30	136170
			123480
			132010
R7	13	30	144595
			133140
			154560
R7	14	30	198360
			189010
			194180
R8	12	30	106800
			97440
			116840
R8	13	30	132495
			126990
			136040
R8	14	30	154560
			145920
			165480

APPENDIX - VI

Cost of operation of developed prototype

Particulars	Cost (Rs.annum ⁻¹)	Cost (Rs.h ⁻¹)	Remarks
Initial Cost (C) – Rs. 31000			
Depreciation (D) at 10% salvage value (S)	5580	15.50	$\frac{31000 - 3100}{5 \times 360}$
Interest (I) at 12%	2046	5.68	$\frac{17050 \times 12}{100 \times 360}$
Insurance and housing @ 2% of C	620	1.72	$\frac{2 \times 31000}{100 \times 360}$
Total fixed cost (A)	8246	22.9	
Repair and maintenance cost (5 % of C)	1550	4.3	$\frac{5 \times 31000}{100 \times 360}$
Operator cost (As per Kerala state government norms)	31950.00	88.75	Rs 710 / 8
Cost of battery recharging	93.528	0.2598	0.08065 kwh 0.2598 Rs/h
Total variable cost (B)	33593.528	93.3	
Total cost of operation	41839.52	116.22	