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APPENDIX

Tensile strength at yield of polymer blends

A1. Data for tensile strength at yield of tapioca starch-filled HDPE blend.

Filler content (%)	Tensile strength at yield of tapioca starch-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.31	25.22	25.22	25.19	25.22	0.06
5	22.19	22.51	22.76	22.94	22.41	22.56	0.26
10	21.78	21.57	22.20	21.93	22.70	22.04	0.44
20	19.12	19.23	19.97	20.07	19.14	19.51	0.42
30	17.16	17.12	17.37	17.13	17.13	17.18	0.12

A2. Data for tensile strength at yield of rice husk-filled HDPE blend (53 µm).

Filler content (%)	Tensile strength at yield of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.36	25.22	25.22	25.19	25.22	0.05
5	23.67	24.04	23.68	23.71	24.10	23.88	0.30
10	22.21	22.17	22.80	23.07	23.36	22.82	0.54
20	20.62	19.91	20.20	20.26	20.19	20.24	0.40
30	16.43	17.02	16.64	17.25	17.91	17.05	0.53

A3. Data for tensile strength at yield of rice husk-filled HDPE blend (180µm).

Filler content (%)	Tensile strength at yield of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.31	25.22	25.22	25.19	25.22	0.05
5	24.00	24.30	24.56	23.38	24.96	24.24	0.60
10	22.39	22.44	22.90	22.26	23.21	22.64	0.40
20	19.04	19.49	19.15	19.13	19.63	19.29	0.26
30	15.57	15.96	15.99	16.21	16.75	16.10	0.43

A4. Data for tensile strength at yield of rice husk-filled HDPE blend (425µm).

Filler content (%)	Tensile strength at yield of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.31	25.22	25.22	25.19	25.22	0.05
5	24.49	25.13	24.70	24.81	24.72	24.77	0.23
10	22.59	23.26	22.60	23.32	22.96	22.95	0.35
20	20.07	19.13	19.92	20.06	20.61	19.96	0.53
30	15.14	15.02	14.87	14.56	15.10	14.94	0.24

A5. Data for tensile strength at yield of burning husk-filled HDPE blend (53μm).

Filler content (%)	Tensile strength at yield of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.31	25.22	25.22	25.19	25.22	0.05
5	25.24	25.54	25.06	25.59	26.15	25.43	0.26
10	25.80	25.56	25.52	25.35	25.65	25.43	0.21
20	24.25	24.82	23.90	24.33	24.54	24.37	0.34
30	23.60	23.64	23.53	23.10	23.17.	23.36	0.20

A6. Data for tensile strength at yield of burning husk-filled HDPE blend (180μm).

Filler Content (%)	Tensile strength at yield of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.31	25.22	25.22	25.19	25.22	0.05
5	24.94	24.33	24.60	24.41	24.60	24.58	0.24
10	24.30	23.46	24.22	23.95	24.09	24.00	0.33
20	23.17	23.16	23.55	22.95	22.56	23.08	0.36
30	21.78	21.73	21.79	21.70	21.64	21.73	0.06

A7. Data for tensile strength at yield of burning husk-filled HDPE blend (425 μm).

Filler content (%)	Tensile strength at yield of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	25.17	25.31	25.22	25.22	25.19	25.22	0.05
5	24.13	24.46	24.31	24.62	24.18	24.34	0.20
10	23.58	23.17	23.28	23.37	23.61	23.40	0.19
20	21.70	21.69	21.47	21.93	22.40	21.84	0.35
30	20.56	20.85	20.73	19.56	19.84	20.31	0.57

Tensile modulus of polymer blends

A8. Data for tensile modulus of tapioca starch-filled HDPE blend.

Filler content (%)	Tensile modulus of tapioca starch-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28
5	1076	1081	1110	987	997	1050	54
10	1251	1134	1181	1086	1077	1146	71
20	1341	1190	1240	1399	1796	1393	293
30	1280	1363	1277	1265	1278	1293	39

A9. Data for tensile modulus of rice husk-filled HDPE blend (53µm).

Filler content (%)	Tensile modulus of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28
5	1105	1101	1326	1358	1325	1243	128
10	1226	1308	1358	1260	1351	1301	57
20	1331	1382	1442	1510	1396	1412	67
30	1791	1798	1770	1610	1614	1717	96

A.11 Data for tensile modulus of rice husk-filled HDPE blend (180µm).

Filler content (%)	Tensile modulus of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28
5	1215	1201	1245	1226	1095	1196	58
10	1153	1196	1384	1517	1410	1332	15
20	1438	1534	1413	1613	1620	1524	96
30	1421	1438	1492	1868	1873	1618	231

A.11 Data for tensile modulus of rice husk-filled HDPE blend (425µm).

Filler content (%)	Tensile modulus of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28.80
5	1343	1316	1474	1479	1474	1417	80.68
10	1564	1596	1659	1587	1612	1604	35.71
20	1668	1672	1887	1804	1816	1769	96.03
30	1881	1875	1735	1714	1810	1803	77.27

A.12 Data for tensile modulus of burning husk-filled HDPE blend (53µm).

Filler content (%)	Tensile modulus of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28
5	1499	1386	1339	1398	1454	1415	62
10	1448	1347	1525	1479	1586	1477	89
20	1743	1920	1745	1872	1977	1852	104
30	2191	1869	2023	1846	1925	1971	140

A.13 Data for tensile modulus of burning husk-filled HDPE blend (180 µm).

Filler content (%)	Tensile modulus of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28
5	1360	1224	1269	1210	1332	1279	65
10	1371	1369	1360	1576	1542	1440	106
20	1672	1520	1617	1560	1525	1579	64
30	2098	2093	1921	1998	1883	1999	97

A.14 Data for tensile modulus of burning husk-filled HDPE blend (425µm).

Filler content (%)	Tensile modulus of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1055	1023	1075	1052	1100	1061	28
5	1064	1094	1083	1119	1250	1122	74
10	1227	1223	1346	1327	1326	1290	59
20	1399	1331	1361	1403	1465	1392	50
30	1887	1927	2005	1974	2028	1964	57

Flexural strength at yield of polymer blends

A.15 Data for flexural strength of tapioca starch-filled HDPE blend.

Filler content (%)	Flexural strength of tapioca starch-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	30.41	30.09	29.83	30.48	29.95	30.15	0.28
10	30.01	29.64	30.25	29.24	30.26	29.88	0.44
20	28.56	28.08	28.56	29.58	28.47	28.65	0.56
30	28.38	28.10	29.11	28.52	29.32	28.69	0.51

A.16 Data for flexural strength of rice husk-filled HDPE blend (53μm).

Filler content (%)	Flexural strength of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	30.34	32.67	32.62	31.53	31.41	31.71	0.97
10	30.21	32.75	31.65	31.73	30.31	31.33	1.07
20	29.54	31.46	30.26	30.65	29.71	30.32	0.77
30	30.36	30.50	28.63	28.94	28.05	29.30	1.08

A.17 Data for flexural strength of rice husk-filled HDPE blend (180 μm).

Filler content (%)	Flexural strength of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	30.38	30.68	31.75	30.21	31.73	30.95	0.74
10	29.96	29.01	29.58	30.89	30.14	29.92	0.70
20	30.54	30.22	29.87	29.74	29.86	30.05	0.33
30	27.66	27.28	28.77	28.41	27.65	27.95	0.61

A.18 Data for flexural strength of rice husk-filled HDPE blend (425 μm).

Filler content (%)	Flexural strength of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	32.96	33.09	32.46	32.40	33.14	32.81	0.35
10	32.78	31.66	33.67	30.30	33.11	32.30	1.34
20	28.16	30.89	32.61	32.62	32.48	31.35	1.95
30	26.14	26.95	26.84	26.12	26.34	26.48	0.39

A.19 Data for flexural strength of burning husk-filled HDPE blend (53 μm).

Filler content (%)	Flexural strength of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	31.64	31.88	31.09	31.74	31.45	31.56	0.31
10	33.87	32.66	33.66	33.91	32.20	33.26	0.78
20	35.73	36.94	36.17	35.36	37.94	36.05	0.68
30	38.50	40.12	38.98	37.98	39.75	39.07	0.88

A.20 Data for flexural strength of burning husk-filled HDPE blend (180 μm).

Filler content (%)	Flexural strength of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	30.17	30.97	30.81	29.94	29.22	30.22	0.71
10	32.06	32.36	30.14	32.24	33.27	32.01	1.15
20	32.99	33.26	32.97	32.13	33.37	32.94	0.49
30	34.14	34.33	34.00	34.46	34.06	34.20	0.19

A.21 Data for flexural strength of burning husk-filled HDPE blend (425 µm).

Filler content (%)	Flexural strength of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	30.64	30.62	30.54	30.71	30.62	30.63	0.06
5	29.99	31.94	32.95	30.58	32.48	31.59	1.26
10	34.33	32.77	32.14	33.33	32.56	33.03	0.85
20	32.00	33.19	34.49	33.47	32.20	33.07	1.01
30	33.97	33.89	34.36	33.85	32.19	33.65	0.84

Flexural modulus of polymer blends

A.22 Data for flexural modulus of tapioca starch-filled HDPE blend.

Filler content (%)	Flexural modulus of tapioca starch-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	952	1186	991	1186	1189	1101	118
10	1196	997	1191	1219	1139	1148	89
20	1213	1382	1491	1339	1510	1387	120
30	1433	1137	1740	1558	1541	1482	222

A.23 Data for flexural modulus of rice husk-filled HDPE blend (53µm).

Filler content (%)	Flexural modulus of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	952	1186	991	1186	1189	1101	118
10	1196	997	1191	1218	1139	1148	89
20	1213	1495	1382	1491	1339	1384	117
30	1433	1558	1541	1568	1487	1517	56

A.24 Data for flexural modulus of rice husk-filled HDPE blend (180µm).

Filler content (%)	Flexural modulus of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	932	1159	1145	1159	1048	1088	99
10	1250	1066	1197	1292	1030	1167	114
20	1573	1524	1473	1511	1546	1525	37
30	1539	1595	1601	1546	1612	1578	33

A.25 Data for flexural modulus of rice husk-filled HDPE blend (425 μm).

Filler content (%)	Flexural modulus of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	1275	1278	1385	1386	1277	1320	59
10	1391	1451	1435	1448	1342	1413	46
20	1532	1683	1607	1611	1664	1616	55
30	1614	1625	1658	1617	1655	1634	21

A.26 Data for flexural modulus of burning husk-filled HDPE blend (53 μm).

Filler content (%)	Flexural modulus of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	1101	1134	1096	1182	1157	1134	36
10	1155	1277	1544	1562	1492	1406	180
20	1691	1659	1719	1795	1614	1696	67
30	1974	1966	2054	2031	1849	1975	79

A.27 Data for flexural modulus of burning husk-filled HDPE blend (180 μm).

Filler content (%)	Flexural modulus of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	1236	1160	1078	1146	1165	1157	55
10	1381	1255	1314	1178	1252	1276	75
20	1482	1330	1426	1356	1345	1382	71
30	1565	1731	1773	1777	1775	1724	91

A.28 Data for flexural modulus of burning husk-filled HDPE blend (425 μm).

Filler content (%)	Flexural modulus of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	1045	1102	1057	1008	1121	1067	45
5	1152	1134	1159	1052	1075	1115	48
10	1292	1358	1327	1369	1393	1348	39
20	1627	1697	1579	1596	1637	1627	45
30	1604	1742	1790	1740	1634	1702	79

Impact strength of polymer blends

A.29 Data for impact strength of tapioca starch-filled HDPE blend.

Filler content (%)	Impact strength of tapioca starch-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	10.0	10.5	10.2	9.7	10.1	10.10	0.30
10	10.7	10.9	11.0	10.3	10.4	10.66	0.30
20	10.8	10.9	10.9	11.5	11.8	11.28	0.47
30	11.6	11.1	12.1	12.5	11.4	11.74	0.56

A.30 Data for impact strength of rice husk-filled HDPE blend (53μm).

Filler content (%)	Impact strength of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	10.9	10.8	11.6	10.5	10.4	10.84	0.47
10	9.6	9.9	9.6	9.8	10.1	9.80	0.21
20	7.3	7.8	7.8	7.6	7.5	7.60	0.21
30	6.7	6.9	6.4	7.0	6.7	6.74	0.23

A.31 Data for impact strength of rice husk-filled HDPE blend (180 μm).

Filler content (%)	Impact strength of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	11.0	11.2	11.4	11.6	11.2	11.28	0.23
10	10.8	10.4	10.6	10.7	10.7	10.64	0.15
20	7.8	7.8	7.6	7.5	7.1	7.56	0.29
30	7.1	6.9	6.5	6.8	6.8	6.82	0.22

A.32 Data for impact strength of rice husk-filled HDPE blend (425 μm)-.

Filler content (%)	Impact strength of rice husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	12.8	12.5	12.5	12.9	12.7	12.68	0.18
10	11.7	11.5	11.5	11.7	11.6	11.60	0.10
20	9.5	9.8	9.5	9.6	9.1	9.50	0.25
30	6.5	6.4	6.6	6.7	6.3	6.50	0.16

A.33 Data for impact strength of burning husk-filled HDPE blend (53µm).

Filler content (%)	Impact strength of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	7.6	7.7	7.3	7.5	7.4	7.50	0.16
10	6.6	6.6	6.0	6.2	6.1	6.30	0.28
20	4.0	4.1	4.1	4.0	4.4	4.12	0.16
30	3.3	3.2	3.1	3.3	3.6	3.30	0.19

A.34 Data for impact strength of burning husk-filled HDPE blend (180µm).

Filler content (%)	Impact strength of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	9.2	9.4	9.4	9.7	9.5	9.44	0.18
10	7.7	7.6	7.5	7.4	7.6	7.56	0.11
20	5.1	5.2	5.3	5.5	5.3	5.28	0.15
30	4.0	4.1	4.2	4.2	4.5	4.20	0.19

A.35 Data for impact strength of burning husk-filled HDPE blend (425 μm).

Filler content (%)	Impact strength of burning husk-filled HDPE blend. (MPa)						
	X ₁	X ₂	X ₃	X ₄	X ₅	mean	SD
0	18.5	18.1	17.5	17.8	17.8	17.94	0.38
5	9.9	9.7	9.5	9.7	9.9	9.66	0.17
10	8.2	8.3	8.1	7.9	8.3	8.16	0.17
20	5.8	5.7	5.6	5.8	5.6	5.70	0.10
30	4.2	4.3	4.1	4.2	4.2	4.20	0.07

Water absorption of polymer blends

A.36 Data for water absorption of tapioca starch-filled HDPE blend

Immersing time (day)	Pure HDPE	5% filler content	10% filler content	20% filler content	30% filler content
0	0	0	0	0	0
2	0.003071	0.02207	0.025068	0.053304	0.084469
6	0.003592	0.0318	0.054343	0.105046	0.174675
10	0.001232	0.040885	0.072243	0.132826	0.219498
14	0.004289	0.063558	0.100932	0.183398	0.292458
16	0.004288	0.070857	0.115872	0.208503	0.328083
21	0.005506	0.086148	0.14938	0.262849	0.409683
31	0.005506	0.114938	0.191739	0.340742	0.516005
36	0.005506	0.122267	0.20726	0.360316	0.560251
41	0.005506	0.131441	0.226977	0.400639	0.602211
48	0.005506	0.139982	0.259383	0.441356	0.651645
55	0.005506	0.157065	0.274172	0.485525	0.721744

A.37 Data for water absorption of rice husk-filled HDPE blend (53 μm).

Immersing time (day)	Pure HDPE	5% filler content	10% filler content	20% filler content	30% filler content
0	0	0	0	0	0
2	0.003071	0.019247	0.029016	0.055789	0.120983
6	0.003592	0.035356	0.079089	0.109207	0.2385
10	0.001232	0.040334	0.06976	0.136797	0.290847
14	0.004289	0.062647	0.106184	0.197245	0.432233
16	0.004288	0.075072	0.127788	0.234262	0.514828
21	0.005506	0.087462	0.152482	0.28006	0.600919
31	0.005506	0.107953	0.188903	0.346355	0.741078
36	0.005506	0.119748	0.211125	0.384534	0.818446
41	0.005506	0.127802	0.222856	0.411525	0.871387
48	0.005506	0.139585	0.246314	0.45204	0.959204
55	0.005506	0.149541	0.267921	0.494304	1.040627

A.38 Data for water absorption of burning husk-filled HDPE blend (53 μm).

Immersing time (day)	Pure HDPE	5% filler content	10% filler content	20% filler content	30% filler content
0	0	0	0	0	0
2	0.003071	0.01272	0.018163	0.033873	0.046379
6	0.003592	0.02914	0.043352	0.071815	0.101216
10	0.001232	0.032784	0.052126	0.087584	0.126088
14	0.004289	0.04916	0.076697	0.124935	0.177548
16	0.004288	0.050419	0.078433	0.131371	0.184331
21	0.005506	0.061329	0.100699	0.165799	0.238024
31	0.005506	0.077729	0.127587	0.213677	0.303598
36	0.005506	0.085612	0.137537	0.232357	0.332457
41	0.005506	0.090492	0.147498	0.246945	0.355639
48	0.005506	0.100817	0.163315	0.276723	0.398611
55	0.005506	0.111131	0.181421	0.307069	0.442132

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