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A P P E N D I X A

PLANT MATERIALS USED IN GLASSHOUSE

AND LABORATORY SCREENING

SUBTROPICAL ANNUAL CROPS

Maize

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|----|----------|--|
| 1. | SNK 2042 | Yellow; excellent performance with stress: drought resistant; also used with irrigation; medium growth length; planting early to medium. |
| 2. | SNK 2888 | Yellow; good performance with stress; good drought resistance; good with irrigation; good acid tolerance (Al); medium growth length. |
| 3. | SNK 2266 | Yellow; performs well on acid soil. |
| 4. | SNK 2151 | White; performs well over a wide range of environments - dryland and irrigation; very good acid tolerance; medium growth length. |
| 5. | SNK 2665 | White; performs with stress (dryland) and irrigation; very good acid tolerance (also Al); medium-tall growth length; suitable for most planting times. |
| 6. | PAN 6480 | Yellow; outstanding agronomic balance; very good resistance to grey leaf spot; medium growing season. |
| 7. | PAN 6364 | Yellow; exceptionally high yield potential; proved under drought stress; medium-short growing season. |
| 8. | PAN 6552 | Yellow; high potential; quick grain fill with particularly good standability; medium growing season. |

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| 9. | PAN 6363 | White; quick, recommended for late plantings. |
| 10. | PAN 6549 | White; outstanding performance under widely varying conditions; known for good standability and grain quality. |
| 11. | PAN 6479 | White; good performance under widely varying conditions including stress; outstanding resistance to grey leaf spot. |
| 12. | CRN 3816 | Yellow |
| 13. | CRN 3414 | Yellow |
| 14. | CRN 3818 | Yellow |
| 15. | CRN 3631 | White |
| 16. | CRN 4403 | White |
| 17. | CRN 4523 | White |
| 18. | SNK 2340 | Yellow; performs particularly well in eastern Highveld; good with centre pivot irrigation and dryland conditions; for early planting; medium growth length.
SNK 2340 was also used in the vegetative evaluation and in the field trials. |

Sorghum

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| 1. | SNK 3860 | Grain; birdproof; very high hay production; used in Middelburg/Stofberg area. |
| 2. | SNK 3939 | Grain; sweet malt (GM); excellent (outstanding) production; any planting date; medium growth length. |
| 3. | SENFOR | Forage; very high forage production; regrowth very fast; high protein; very palatable. |

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| 4. | SENTOP | Forage; very high forage production; regrowth very good; high protein; low hydrocyanic acid. |
| 5. | SNK 3000 | Grain for ensiling; high biomass and grain; medium growth length; good drought resistance. |
| 6. | PAN 8494 | |
| 7. | PAN 8501 | Grain; good livestock feed (sweet type); medium to long growing season; stands exceptionally until harvest; strong "stay-green" characteristic; short even plant with thick stalk. |
| 8. | PAN 8522 | |
| 9. | PAN 8564 | Grain; reliable medium to long growing season; good yield potential; good malting and feed characteristics. |
| 10. | PAN 8591 | Grain; medium to long growing season; good yield potential; medium plant height; wide area adaptability; GM malt class. |
| 11. | NK 283 | Industrial standard (PANNAR); most popular sorghum hybrid; high yield potential, long growing period. |
| 12. | PAN 888 | Leafy forage hybrid; performs well on marginal soils; also used in the vegetative evaluation and field trials. |
| 13. | CRN 766W | |
| 14. | CRN 7686 | |

Pearl Millet (Babala)

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| 1. | PAN 911 | Hybrid forage millet; outstanding summer grazing; recovers quickly after drought; can be planted as soon as soil temperatures are suitable |
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(early October); also for haymaking and ensiling. Seed variable.

2. SA Standard The same seed that was used in the vegetative evaluation and field trials. Seed variable.

Soybean

1. Bakgat (Sensako) Short growing season; planting time 15 November to 15 December; short growth length; used for irrigation.
2. Ibis (Sensako) Strongly recommended for warmer areas. Also used in sand culture pot trials and in the field trial.
3. PAN 494 Top performance; excellent standability; intermediate growth habit; good protein and oil content.
4. PAN 577G Short to medium growing season; recommended for coal production areas; recommended for later plantings in warm areas; very good standability; stable above average yield potential; fairly branched upright determinate growth habit.
5. PRIMA (Pannar) Most widely planted in Highveld; medium-short growing period; excellent yield potential; widely recommended particularly for temperate regions.
6. HUTCHESON (Pannar)
7. A 2233 (Carnia)
8. A 5409 (Carnia)
9. A 7119 (Carnia)

Dry bean (for furrow irrigation)

1. PAN 122 small white canning bean

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| 2. | PAN 127 | speckled sugar bean |
| 3. | MKUSI | very aluminium tolerant; does well in marginal conditions; responds very well to fertiliser; seed type carioca not popular; soil temperature critical - must be at least 11-12°. |
| 4. | NANDI | genetically similar to MKUSI with the same characteristics. |

Cowpea

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| 1. | Dr Saunders | used in field trial - generally produces better under hot, dry conditions; generally not well adapted to cooler areas. |
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Sunflower

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| 1. | SNK 43 | Medium-long growing period; increased resistance to disease. |
| 2. | SNK 34 | Short growing period; early-late and late planting; drought resistance good; short growth length. |
| 3. | SNK 37 | Medium-long growing period; early and first in later planting, drought resistance good; used with irrigation on Highveld. |
| 4. | PAN 7392 | Medium growing period; top performer in National trials. |
| 5. | PAN 7411 | |
| 6. | PAN 7369 | Medium growing period; high potential; very adaptable; best yield reliability of all cultivars in the one to two ton category. |
| 7. | CRN 1445 | |
| 8. | CRN 543 | |
| 9. | A 1006 9 (CARNIA) | |

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TEMPERATE ANNUAL CROPS

Oats

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|----|--------------------------------|--|
| 1. | SSH 421 (SENSAKO) | Plant height - tall; medium growing season; fast grower can be cut every 3 weeks. |
| 2. | SSH 423 (SENSAKO) | Plant height - tall; medium/late growing season |
| 3. | Witteberg (Small Grain Centre) | |
| 4. | Perdeberg (Small Grain Centre) | |
| 5. | Echidna (Small Grain Centre) | |
| 6. | Overberg | Probably developed for winter rainfall area; the same seed that was used in the vegetative evaluation and in the field trial |

Barley

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| 1. | Stirling (Small Grain Centre) |
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Triticale

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| 1. | Kiewiet (Small Grain Centre) | |
| 2. | SShR1 (Small Grain Centre) | |
| 3. | Rex (Small Grain Centre) | |
| 4. | PAN 299 | |
| 5. | SSKR 626 (SENSAKO) | Tall; fast grower; very late |
| 6. | SSKR 628 (SENSAKO) | Tall; slow grower; very late; used for winter pasture |

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7. Cloc 1 Same seed as used in the vegetative evaluation and field trial

Wheat (all cultivars recommended for irrigation as in cooler eastern Highveld areas)

1. SST 822 (replaces SST 86) Short growth period; best response to increasing N-fertilisation; sensitive to drought stress; needs efficient irrigation management; good resistance to sprouting; good Al tolerance.
2. SST 825 Medium growth period.
3. Palmiet Medium growth period; poor Al tolerance (?); good resistance to sprouting.
4. Marico Longer growth period; poor Al tolerance.
5. Kariega Longer growth period; poor Al tolerance.
6. Inia For later planting; also popular for warmer Transvaal irrigation regions, e.g. Springbok flats; poor Al tolerance; used in vegetative evaluation and field trial.
7. Wheat cultivar bred for use as a nursecrop on mine spoils from USA.

Rye

1. SSR 727 Same qualities as SSR 1 but resistant to aphids.
2. SSR 729 Drought resistant
3. SSR 1 Uses moisture efficiently; also used in vegetative evaluation and field trial
4. Henoeh

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APPENDIX B

ANALYSES OF FINAL SAMPLES OF MINES A, B & C WATER

MAINLY FOR TRACE METALS

MINE A - lime-treated acid mine drainage water Kromdraai		
DETERMINAND	UNIT	RESULT
Major inorganic determinands		
PH		6.6
NH ₄ -N	mg/l	3.10
NO ₃ + NO ₂ -N	mg/l	1.42
F	mg/l	0.5
TAL AS CaCO ₃	mg/l	10
Na	mg/l	4
Mg	mg/l	20
Si	mg/l	< 0.4
PO ₄ -P	mg/l	0.028
SO ₄	mg/l	1386
Cl	mg/l	4
K	mg/l	2.7
Ca	mg/l	552
EC	mS/m	219.0
TDS	mg/l	1991
Trace metals		
Be	mg/l	< 0.001
Be-ACID SOL	mg/l	< 0.001
B	mg/l	< 0.002
B-ACID SOL	mg/l	< 0.002
Al	mg/l	0.673
Al-ACID SOL	mg/l	0.741
Ti	mg/l	< 0,001

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DETERMINAND	UNIT	RESULT
Ti-ACID SOL	mg/l	< 0.001
V	mg/l	0.028
V-ACID SOL	mg/l	0.052
Cr	mg/l	0.063
Cr-ACID SOL	mg/l	0.068
Mn	mg/l	2.159
Mn-ACID SOL	mg/l	2.128
Fe	mg/l	< 0.003
Fe-ACID SOL	mg/l	0.114
Co	mg/l	< 0.005
Co-ACID SOL	mg/l	0.012
Ni	mg/l	0.068
Ni-ACID SOL	mg/l	0.075
Cu	mg/l	< 0.004
Cu-ACID SOL	mg/l	0.103
Zn	mg/l	< 0.003
Zn-ACID SOL	mg/l	< 0.003
Sr	mg/l	0.312
Sr-ACID SOL	mg/l	0.256
Zr	mg/l	< 0.001
Zr-ACID SOL	mg/l	< 0.001
Mo	mg/l	< 0.006
Mo-ACID SOL	mg/l	< 0.006
Cd	mg/l	< 0.001
Cd-ACID SOL	mg/l	< 0.001
Ba	mg/l	0.015
Ba-ACID SOL	mg/l	0.018
Pb	mg/l	< 0.020
Pb-ACID SOL	mg/l	< 0.020

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MINE B - CaSO₄-dominated mine water from the Kleinkopje mining area		
DETERMINAND	UNIT	RESULT
Major inorganic determinands		
PH		8.5
NH ₄ -N	mg/l	1.18
NO ₃ + NO ₂ -N	mg/l	< 0.04
F	mg/l	3.7
TAL AS CaCO ₃	mg/l	299
Na	mg/l	1252
Mg	mg/l	48
Si	mg/l	4.1
PO ₄ -P	mg/l	0.029
SO ₄	mg/l	1384
Cl	mg/l	871
K	mg/l	10.3
Ca	mg/l	49
EC	mS/m	570.0
TDS	mg/l	3984
Trace metals		
Be	mg/l	< 0.001
Be-ACID SOL	mg/l	< 0.001
B	mg/l	< 0.002
B-ACID SOL	mg/l	< 0.002
Al	mg/l	0.269
Al-ACID SOL	mg/l	0,406
Ti	mg/l	< 0.001
Ti-ACID SOL	mg/l	< 0.001
V	mg/l	0.050
V-ACID SOL	mg/l	0.053
Cr	mg/l	< 0.003
Cr-ACID SOL	mg/l	0.014
Mn	mg/l	< 0.001
DETERMINAND	UNIT	RESULT

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Mn-ACID SOL	mg/l	< 0.001
Fe	mg/l	< 0.003
Fe-ACID SOL	mg/l	< 0.003
Co	mg/l	0.023
Co-ACID SOL	mg/l	0.030
Ni	mg/l	0.147
Ni-ACID SOL	mg/l	0.152
Cu	mg/l	< 0.004
Cu-ACID SOL	mg/l	0.039
Zn	mg/l	< 0.003
Zn-ACID SOL	mg/l	< 0.003
Sr	mg/l	4.006
Sr-ACID SOL	mg/l	3.547
Zr	mg/l	< 0.001
Zr-ACID SOL	mg/l	< 0.001
Mo	mg/l	< 0.006
Mo-ACID SOL	mg/l	< 0.006
Cd	mg/l	< 0.001
Cd-ACID SOL	mg/l	< 0.001
Ba	mg/l	0.077
Ba-ACID SOL	mg/l	0.073
Pb	mg/l	< 0.020
Pb-ACID SOL	mg/l	< 0.020

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MINE C - NaCl-dominated mine water the New Denmark mine, Standerton		
DETERMINAND	UNIT	RESULT
Major inorganic determinands		
PH		8.3
NH ₄ -N	mg/l	0.18
NO ₃ + NO ₂ -N	mg/l	0.29
F	mg/l	0.4
TAL AS CaCO ₃	mg/l	94
Na	mg/l	56
Mg	mg/l	191
Si	mg/l	6.4
PO ₄ -P	mg/l	0.029
SO ₄	mg/l	2065
Cl	mg/l	19
K	mg/l	10.9
Ca	mg/l	537
EC	mS/m	318.0
TDS	mg/l	2996
Trace metals		
Be	mg/l	< 0.001
Be-ACID SOL	mg/l	< 0.001
B	mg/l	< 0.002
B-ACID SOL	mg/l	< 0.002
Al	mg/l	0.615
Al-ACID SOL	mg/l	0.647
Ti	mg/l	< 0.001
Ti-ACID SOL	mg/l	< 0.001
V	mg/l	0.050

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DETERMINAND	UNIT	RESULT
V-ACID SOL	mg/l	0.059
Cr	mg/l	< 0.003
Cr-ACID SOL	mg/l	< 0.003
Mn	mg/l	5.508
Mn-ACID SOL	mg/l	6.920
Fe	mg/l	< 0.003
Fe-ACID SOL	mg/l	< 0.003
Co	mg/l	0.047
Co-ACID SOL	mg/l	0.051
Ni	mg/l	0.131
Ni-ACID SOL	mg/l	0.148
Cu	mg/l	0.039
Cu-ACID SOL	mg/l	0.086
Zn	mg/l	< 0.003
Zn-ACID SOL	mg/l	< 0.003
Sr	mg/l	2.745
Sr-ACID SOL	mg/l	2.602
Zr	mg/l	< 0.001
Zr-ACID SOL	mg/l	< 0.001
Mo	mg/l	< 0.006
Mo-ACID SOL	mg/l	< 0.006
Cd	mg/l	< 0.001
Cd-ACID SOL	mg/l	< 0.001
Ba	mg/l	0.027
Ba-ACID SOL	mg/l	0.027
Pb	mg/l	< 0.020
Pb-ACID SOL	mg/l	< 0.020

Hg, As, Se: There were traces of Hg in all three mine waters but no As or Se.