Appendix

Structural models in rice

Leaf blade length models

The $j$th leaf blade length on main stem on $i$th d after emergence (in cm), $LL_j(i)$, can be calculated as follows:

$LL_j(i) = DWLB_j(i) \times RLW_j(i)$

$DWLB_j(i) = CPLB_j(i) \times DWSP(i)$

$DWSP(i) = X, \quad MDWSP(i) - MDWSP(i) \leq X \leq MDWSP(i) + MDWSP(i)$

$RLW_j(i) = 4026.103 - 2162.051 LP_{ji} + 504.183 LP_{ji}^2 - 41.241 LP_{ji}^3, 1 \leq j \leq 6$

$CPLB_j(i) = e^{(CP1+CP2/LP_{ji})}, 1 \leq j \leq 6$

Where $DWLB_j(i)$, $RLW_j(i)$, and $CPLB_j(i)$ are the $j$th leaf blade dry weight (in g), the ratio of the $j$th leaf blade length to blade dry weight (in cm g$^{-1}$), and the ratio of the $j$th leaf blade dry weight to whole single aboveground plant (in g g$^{-1}$) on $i$th d after emergence, respectively. $DWSP(i)$ is the dry weight per plant on $i$th d after emergence (in g plant$^{-1}$), $MDWSP(i)$ is the mean dry weight per plant on $i$th d after emergence (in g plant$^{-1}$), $SDWSP(i)$ is the standard error of dry weight per plant on $i$th d after emergence (determined by experiment) (in g plant$^{-1}$), $DWCP(i)$ is the dry weight in canopy per area on $i$th d after emergence (in g m$^{-2}$), DES represents the plant number per area (in plant m$^{-2}$) (as one parameter of cultivation practices), and $LP_{ji}$ is the leaf position on main stem on $i$th d after emergence.

Maximum leaf blade width model

The $j$th maximum leaf blade width on $i$th d after emergence (in cm), $LW_j(i)$, could be represented by a growth function as in EQN (8)

$LW_j(i) = e^{-1.591+0.085 LL_j(i)}, 1 \leq j \leq 6$

Where the symbols are the same as above.

Leaf sheath length model
The \( j \)th leaf sheath length of fully grown leaves on \( i \)th day after emergence (in cm), \( LS_j (i) \), of different cultivars with the leaf blade length on main stem could be represented by a power function.

\[
LS_j (i) = 1.846 LL_j^{0.452}, \quad 1 \leq j \leq (6 - 1)
\]

Where the symbols are the same as above.

Leaf blade bowstring length model

The \( j \)th leaf blade bowstring length on \( i \)th day after emergence (in cm), \( LBBL_j (i) \), is a property of leaf blade bend degree (the maximum \( LBBL_j (i) \) = \( LL_j (i) \)), and it can be expressed as

\[
LBBL_j (i) = 0.040 + 0.957 LL_j (i), \quad 1 \leq j \leq 6
\]

Where the symbols are the same as above.

Leaf blade angles models

The blade tangent angle (TA) (\(^\circ\)), \( \angle O'OB \), and blade bowstring angle (BA) (\(^\circ\)), \( \angle O'OA \) (Fig. 19) are

\[
TA_j (i) = DWLB_j (i) \times RTW_j (i)
\]
\[
BA_j (i) = DWLB_j (i) \times RBW_j (i)
\]
\[
RTW_j (i) = 72942.326 LP_j^{-3.225}, \quad 1 \leq j \leq (6 - 1)
\]
\[
RBW_j (i) = 76830.636 LP_j^{-2.906}, \quad 1 \leq j \leq (6 - 1)
\]

Where \( RTW_j (i) \) and \( RBW_j (i) \) are the ratio of the blade tangent angle, and the blade bowstring angle to the \( j \)th leaf blade dry weight on main stem on \( i \)th day after emergence (\(^\circ\) g\(^{-1}\)), respectively, and the other symbols are the same as above.

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Fig. Chart of leaf blade angles.