a

$$Y_{max} = Y_{temp}$$
$$When: max\ (\boldsymbol{r_p} - Y_{temp} \cdot \boldsymbol{r_s}) = 0$$
$$s.t. \quad \boldsymbol{S} \cdot \boldsymbol{r} = 0$$
$$\boldsymbol{r^{lb}} \leq \boldsymbol{r} \leq \boldsymbol{r^{ub}}$$
$$\boldsymbol{r_p} \geq \boldsymbol{0}, \boldsymbol{r_s} > \boldsymbol{0}$$

b

$$r_p^{FBA}, r_s^{FBA} \leftarrow \textbf{FBA}$$
$$Y_{temp0} = \frac{r_p^{FBA}}{r_s^{FBA}}$$
$$\Delta_0 > 0$$
WHILE $\Delta > 0$
$\quad \Delta = r_p - Y_{temp} \cdot r_s$
$\quad \Delta, r'_p, r'_s \leftarrow max\ (\Delta)$
$\qquad\quad s.t. \quad Y_{temp} \geq 0$
$\qquad\qquad\qquad S \cdot r = 0$
$\qquad\qquad\qquad r^{lb} \leq r \leq r^{ub}$
$\qquad\qquad\qquad r_s > 0$
$\quad IF: \Delta = 0$
$\qquad\qquad\qquad Y_{max} = Y_{temp}$
$\quad$ ELSE*:*
$Y_{temp} = \frac{r'_p}{r'_s}$
$\quad$ *ENDIF*
ENDWHILE
OUTPUT Y_{max}

c

$Y \downarrow$

r_p (mmol/gDW/h)

Max (*Y*)

Max (*r*)

$r_p - Y_{temp} \cdot r_s$

$Y_{temp} \cdot r_s$

r_s (mmol/gDW/h)