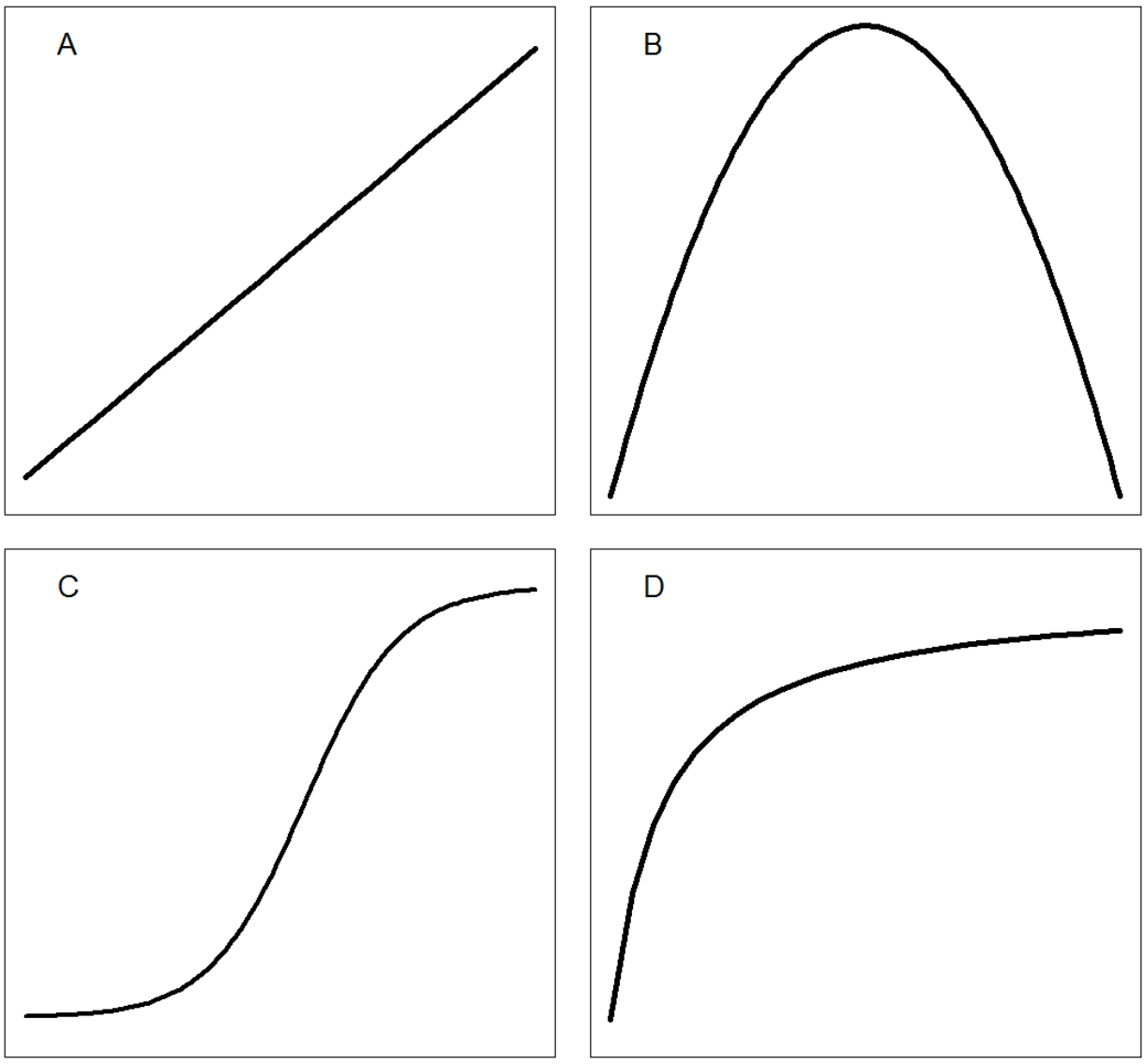

Figure 1. Common regression curves used to describe the data from crop-weed competition studies in additive design: A) linear; B) polynomial quadratic; C) sigmoid (logistic model); D) rectangular hyperbola (Cousens model).

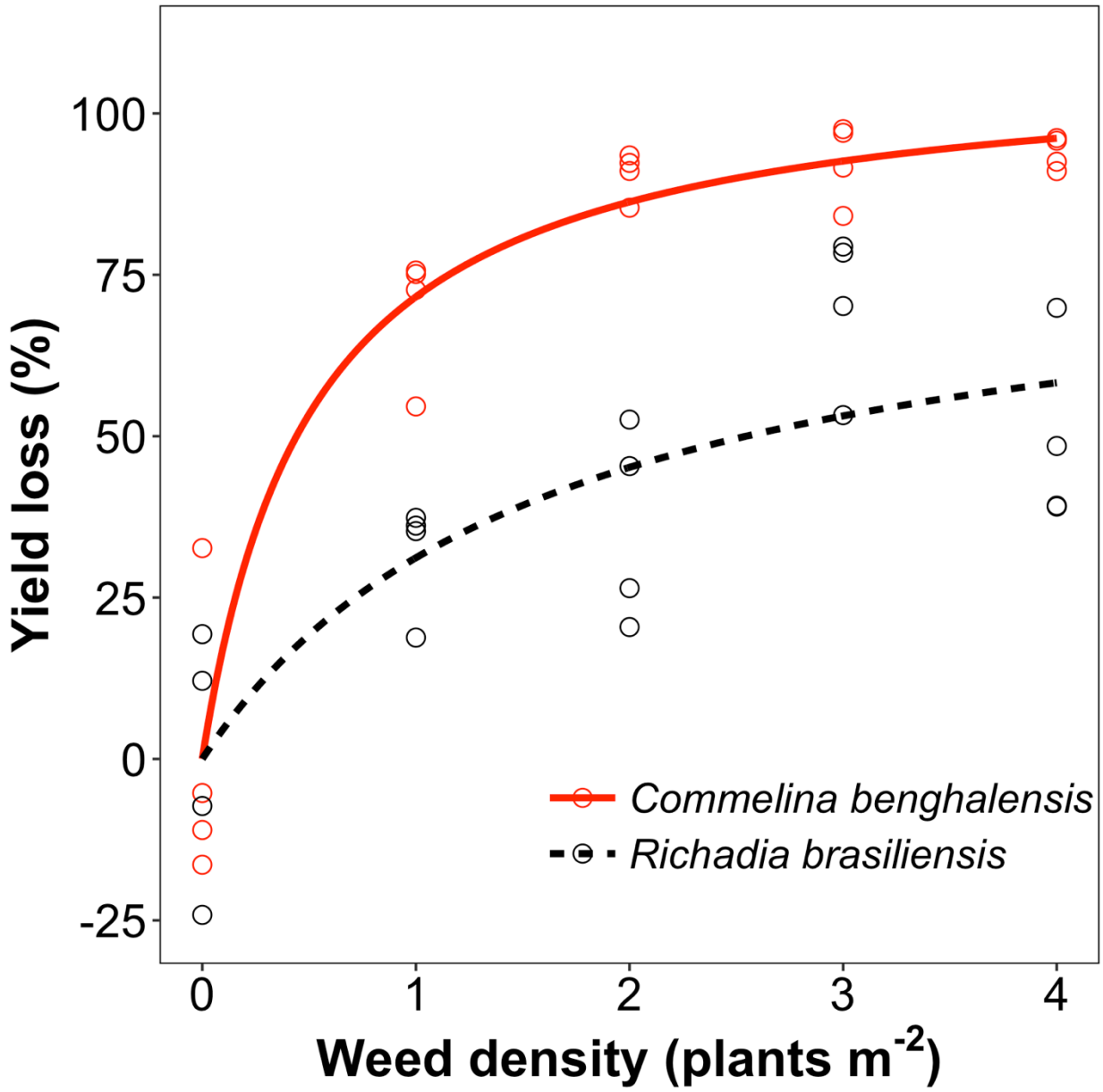

Figure 2. Relationship between corn biomass reduction (%) and weed density (plants pot^{-1}) described with the rectangular hyperbola model. Red dotted and black solid lines represent *R. brasiliensis* and *C. benghalensis*, respectively

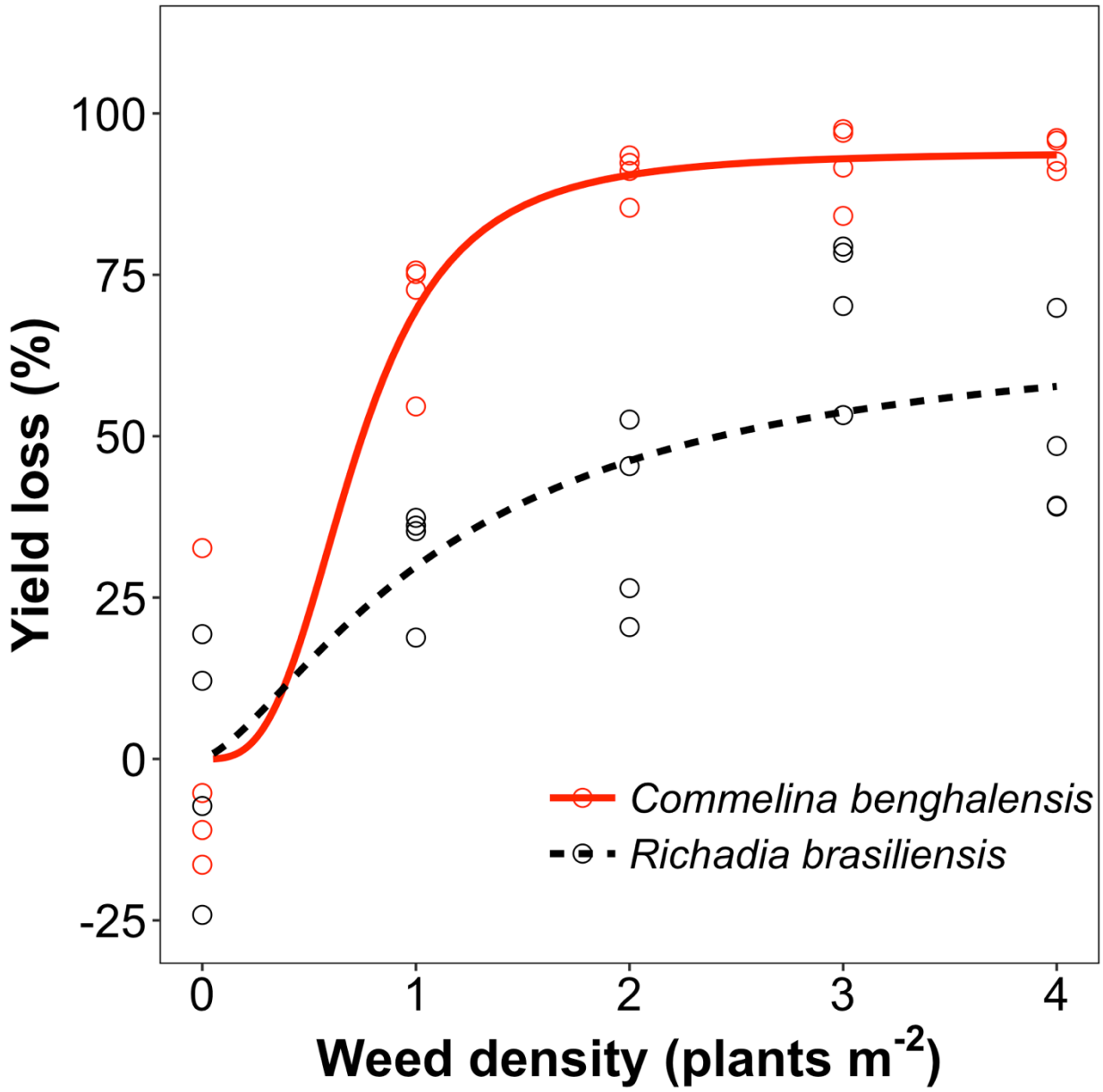

Figure 3. Relationship between maize biomass reduction (%) and weed density (plants pot^{-1}) fitted with a logistic model. Red dotted lines represent *R. brasiliensis* and black solid line represents *C. benghalensis*.

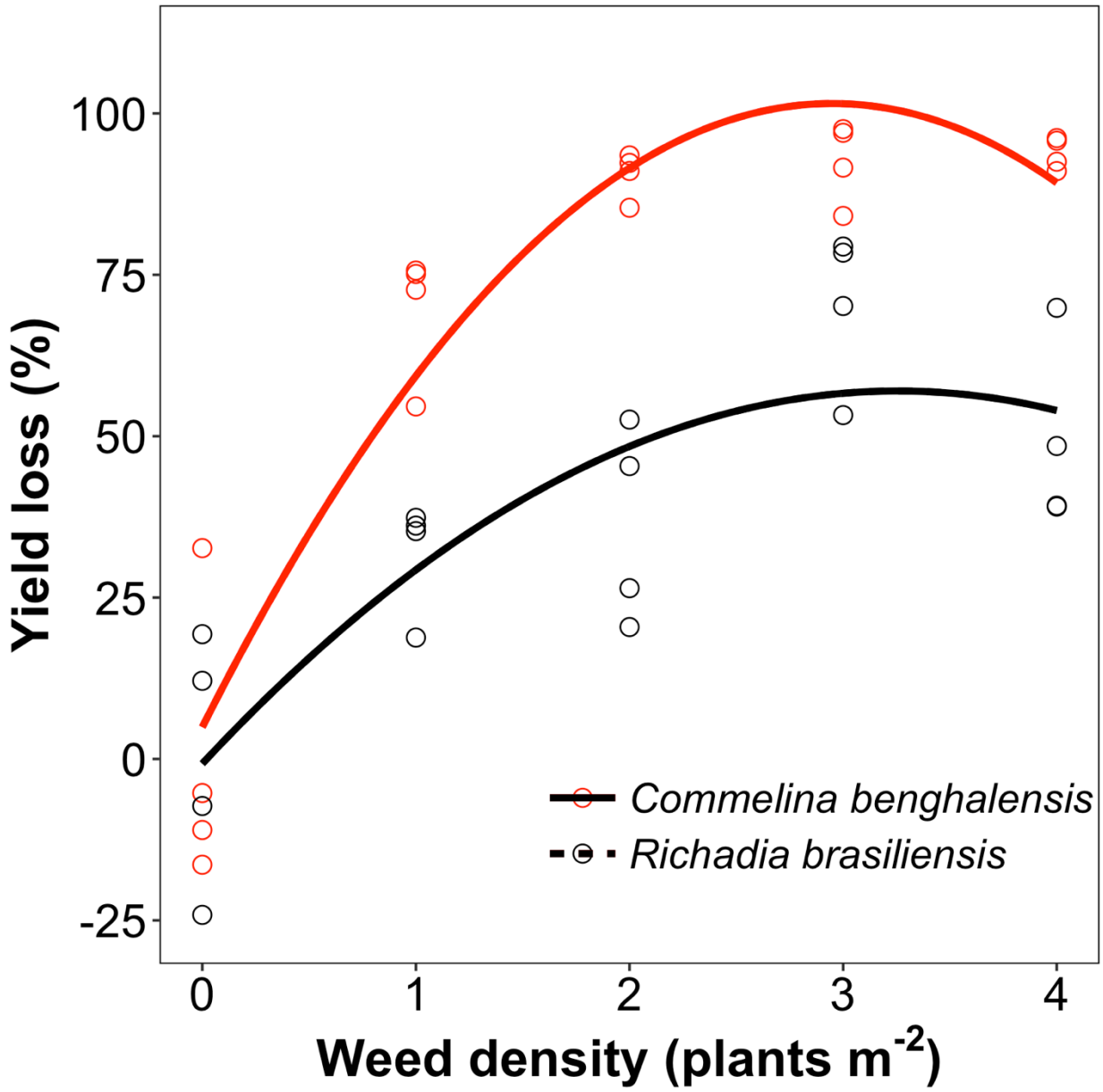

Figure 4. The relationship between maize biomass reduction (%) and weed density (plants pot^{-1}) fitted with a polynomial quadratic model. Red dotted lines represent *R. brasiliensis,* and the black solid line represents *C. benghalensis*.

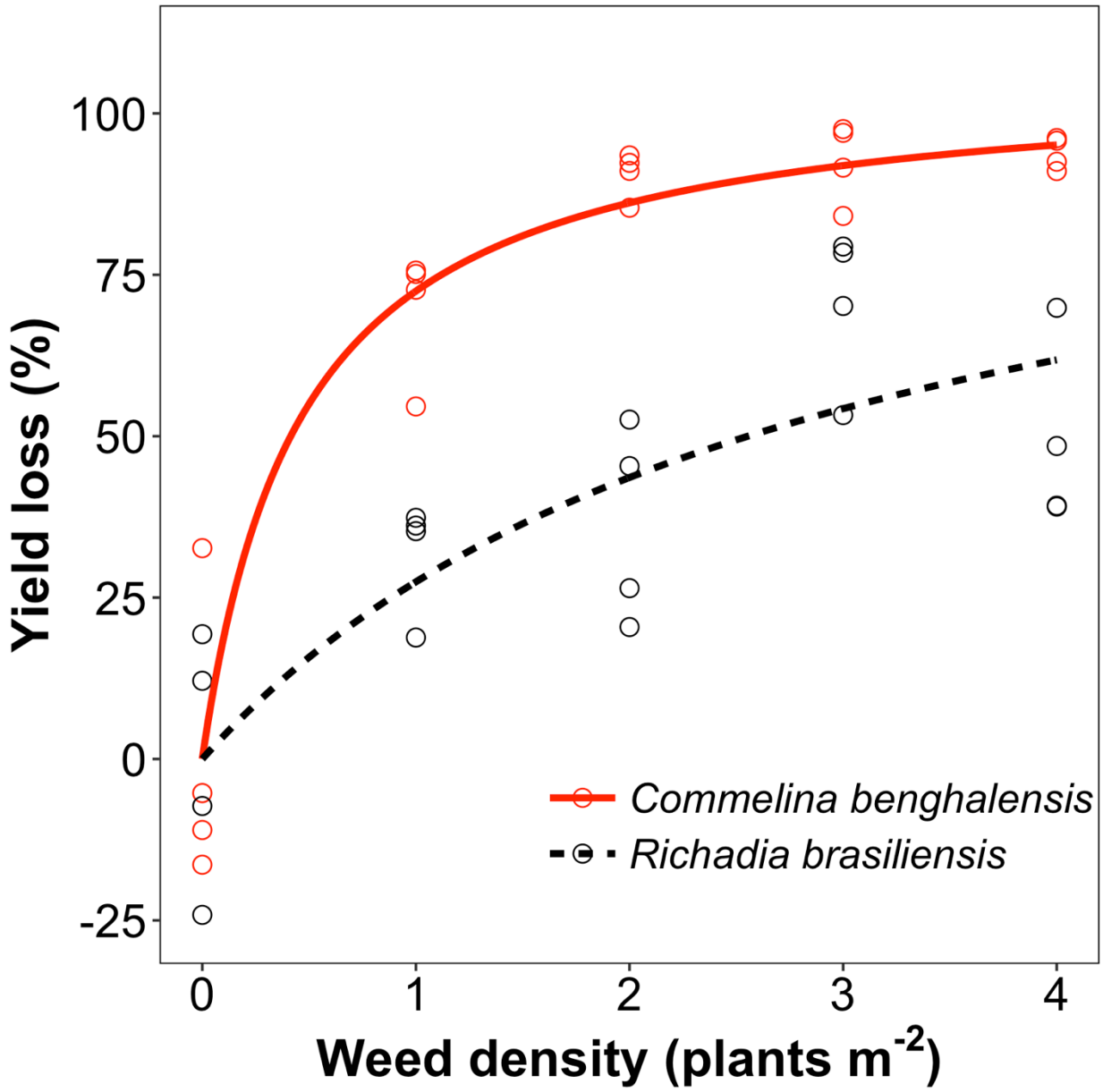

Figure 5. The relationship between maize biomass reduction (%) and weed density (plants pot^{-1}) fitted with rectangular hyperbola model. Red dotted lines represent *R. brasiliensis,* and the black solid line represents *C. benghalensis*.

Table 1. Corn yield loss (%) model comparison among polynomial quadratic, logistic, and Cousens.

Models	Species	Model Selection[1]	Goodness of Fit[2]		
		AICc	RMSE	ME	R^2
Polynomial quadratic	*C. benghalensis*	343.1	19.4	0.90	0.89
	R. brasiliensis			0.71	0.71
Logistic	*C. benghalensis*	337.6	13.2	0.85	-
	R. brasiliensis			0.58	-
Cousens	*C. benghalensis*	332.2	12.6	0.92	-
	R. brasiliensis			0.64	-

[1]Alkeike's information criterion (AIC).

[2]Root mean square error (RMSE), model efficiency (ME), and R-squared (R^2). R^2 is not appropriate for nonlinear models (logistic and Cousens)

Table 2. Cousens model parameters estimates, standard error, t-value and P-value of maize biomass reduction (%) caused by competition of *R. brasiliensis* and *C. benghalensis*.

Parameters[1]	Species	Estimate	Standard Error	t-value	P-value
		%			
I	*R. brasiliensis*	50.3	22.6	2.2	0.03
	C. benghalensis	210.2	88.6	2.4	0.02
A	*R. brasiliensis*	82.1	23.1	3.6	0.00
	C. benghalensis	108.6	11.1	9.7	0.00

[1]*I*: represents maize biomass reduction (%) per unit weed density as density approaches 0; *A*: represents maize biomass reduction (%) as density approaches ∞ (or maximum expected yield loss).

[2]If P<0.05, there is no lack of fit; If P>0.05, there is a lack of fit. *** Significant at <0.01.

Table 3. Logistic model parameters estimates, standard error, t-value and P-value of maize biomass reduction (%) caused by competition of *R. brasiliensis* and *C. benghalensis*.

Parameters[1]	Species	Estimate	Standard Error	t-value	*P*-value
		%			
b	*R. brasiliensis*	-1.5	1.4	-1.1	0.29
	C. benghalensis	-3.2	5.1	-0.6	0.54
c	*R. brasiliensis*	0.2	7.4	-<0.0	0.99
	C. benghalensis	-5.3	7.4	-<0.0	0.98
d	*R. brasiliensis*	67.2	26.9	2.5	0.02
	C. benghalensis	93.4	8.4	11.1	0.00
e	*R. brasiliensis*	1.2	0.7	1.6	0.12
	C. benghalensis	0.7	0.3	2.1	0.04

[1]*b*: slope; *c*: lower limit (weed competition at low densities); d: upper limit (maximum expected maize biomass reduction, %); *e*: inflection point (weed density at maize biomass reduction is 50% relative to *d*.

[2]If P<0.05, there is no lack of fit; If P>0.05, there is a lack of fit. *** Significant at 0.01; * Significant at 0.1; NS, not significant.

Table 4. Polynomial quadratic parameters estimates, standard error, t-value and P-value of maize biomass reduction (%) caused by competition of *R. brasiliensis* and *C. benghalensis*.

Parameters[1]	Species	Estimate	Standard Error	t-value	P-value
		———	% ———		
Intercept	*R. brasiliensis*	-0.7	7.7	-0.1	0.92
	C. benghalensis	4.9	6.1	0.8	0.43
Slope	*R. brasiliensis*	35.5	9.1	3.8	0.00
	C. benghalensis	65.5	7.3	9.0	0.00
Quadratic	*R. brasiliensis*	-5.4	2.2	-2.5	0.02
	C. benghalensis	-11.1	1.7	-6.4	0.00

[1]*Intercept*: intercept at Y-value when density equals zero; Slope: the slope of the equation; *quadratic*: the quadratic term of the equation.

[2]If P<0.05, there is no lack of fit; If P>0.05, there is a lack of fit. *** Significant at 0.01; * Significant at 0.1; NS, not significant.

Table 5. Nested model selection criteria and goodness of fit of Cousens model parameters I and A of maize biomass reduction (%) with *R. brasiliensis* and *C. benghalensi*s.

Cousens Models	Species	Model Selection[1]			Goodnes of fit[2]	
		F-test		AICc	RSME	ME
		F-value	P-value			
Different I and A (Full)	*R. brasiliensis* *C. benghalensis*	-	-	332.2	13.3	0.92 0.64
Similar I and A (Red. I)	*R. brasiliensis* *C. benghalensis*	32.3	0.00	368.2	22.2	0.84
Similar I but different A (Red. II)	*R. brasiliensis* *C. benghalensis*	4.1	0.05	333.9	14.0	0.97 0.69
Similar A but different I (Red. III)	*R. brasiliensis* *C. benghalensis*	0.7	0.40	330.4	13.4	0.98 0.95

[1]F-test model selection; P<0.05: significant different models; P>0.05: non-significant different models. Alkeike's information criterion (AIC);

[2]Root mean square error (RMSE) and model efficiency (ME).

Table 6. Cousens model parameters estimates, standard error, t-value and P-value of corn yield loss (%) caused by competition of *R. brasiliensis* and *C. benghalensis*.

Parameters[1]	Species	Estimate	Standard Error	t-value	P-value
		%			
I	*R. brasiliensis*	37.0	6.2	5.9	0.00
	C. benghalensis	228.3	100.2	2.3	0.03
A	*R. brasiliensis* *C. benghalensis*	106.1	10.3	10.3	0.00

[1] *I*: represents maize biomass reduction (%) per unit weed density as density approaches 0; *A*: represents maize biomass reduction (%) as density approaches ∞ (or maximum expected yield loss).

[2]If P<0.05, there is no lack of fit; If P>0.05, there is a lack of fit. *** Significant at <0.01.