MACRO AND MICRONUTRIENT REMOVAL IN IRRIGATED COTTON SEED

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Abstract

Macro and micronutrient uptake in mature cotton seed is an important measure of nutrient removal from the field. Cotton seed was collected from different irrigation and nitrogen management studies. Studies were in LEPA and drip irrigation systems and had picker or stripper varieties. Although yields and nutrient uptakes were greater with picker vs. stripper varieties, nutrient uptake per bale were similar. An average of 25.5, 3.5, 7.3, and 2.4 lb N, P, K, and S /bale, respectively were removed in cotton seed. Monitoring the nutrient status of cotton seed and calculating nutrient removal provides valuable information for nutrient budgeting, maintenance and other nutrient management approaches.

Materials and Methods

Studies consisted of five variety-site-yr combinations in N fertility trials conducted from 2002 - 2005 (Table1, (Bronson et al., 2006, Yabaji et al., 2009 and Wheeler et al., 2009). A total of 180 samples of mature delinted seed was collected and analyzed for Nitrogen (N), Phosphorus (P), Potassium (K), Sulfur (S) and Zinc (Zn). Seed nutrient uptake was calculated by multiplying the seed nutrient content with seed yields**.**

Table 1. Management-year-variety combinations in Study

Year	Type	Variety	Number of Samples	Soil Type	Irrigation
2002	Stripper	PM 2326 RR	43	Amarillo Sandy Loam	LEPA
2004	Picker	FM989 RR	46	Amarillo Sandy Loam	LEPA
2005	Stripper	PM2280	9	Amarillo Sandy Loam	LEPA
2005	Picker	ST5599	9	Amarillo Sandy Loam	LEPA
2005	Picker	FM989 RR	74	Acuff sandy clay loam	Drip

Results

- Lint yields ranged from 1.8 – 4.7 bale ac^{-1} (Fig. 1, 2, 3, 4 &5).
- In all years, lint yields, seed yields, and nutrient uptake were greater with picker compared to stripper varieties (Table 2).
- Seed nutrient uptake $bale^{-1}$ averaged 25.5, 3.5, 7.3, 2.4, and 0.04 lb for N, P, K, S and Zinc respectively (Table 2).
- Seed Nutrient uptake $bale^{-1}$ did not differ between stripper and picker (Table 2).
- Regression slopes of nutrient uptake vs. lint yields decreased in the order of N, K, P, S, and Zn.
- K off-take would be higher for stripper harvesters that do not extract cotton burrs (burrs were 1.5 - 3.4 % K).

Table 2. Seed Nutrient Uptake of Picker and Stripper Variety Cotton Grown in the Southern High Plains

			Seed Uptake				
	Lint Yield	Seed Yield	N	P	K	S	Zn
	Bale ac^{-1}	lb ac^{-1}	---------- lb ac^{-1}----------				
Picker	3.3	2308	81.4	10.9	22	7.5	0.1
Stripper	2.5	1905	64.2	9.1	18.5	6.3	0.08
			---------- lb $bale^{-1}$----------				
Picker			25	3.4	6.9	2.3	0.03
Stripper			26	3.7	7.5	2.6	.0.04

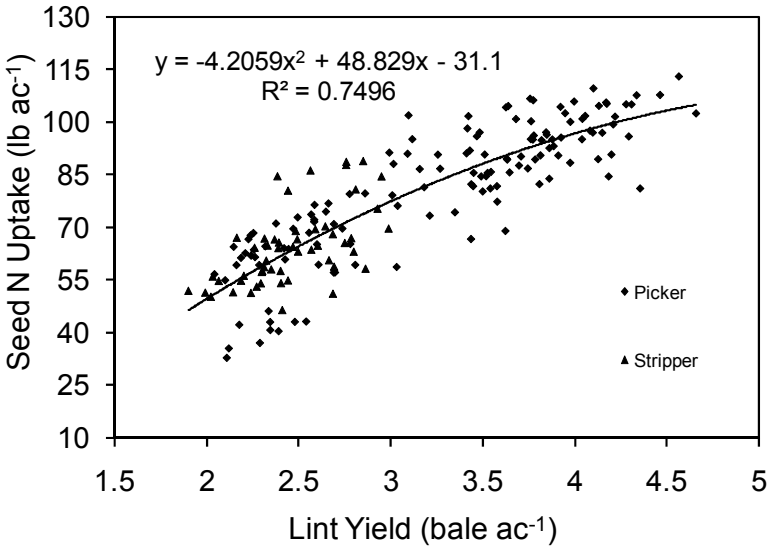

Fig. 1. Regressions of N seed uptake in cotton seed vs. lint yield

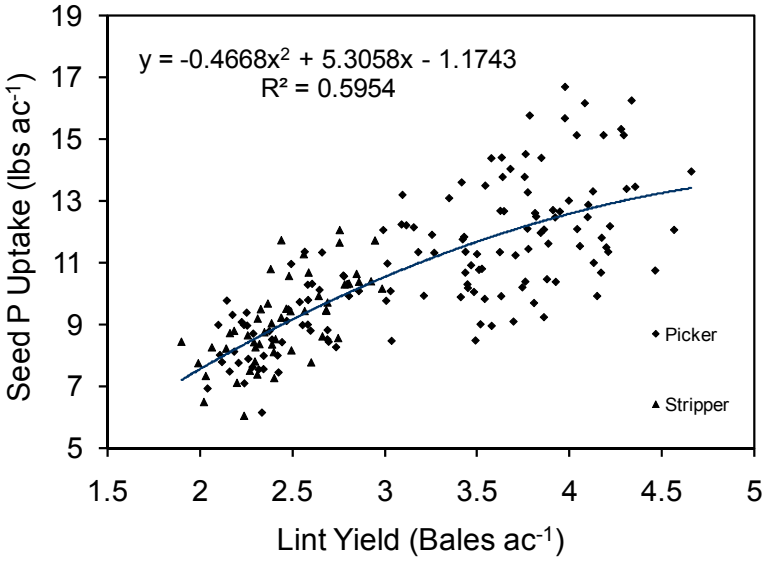

Fig. 2. Regressions of P seed uptake in cotton seed vs. lint yield

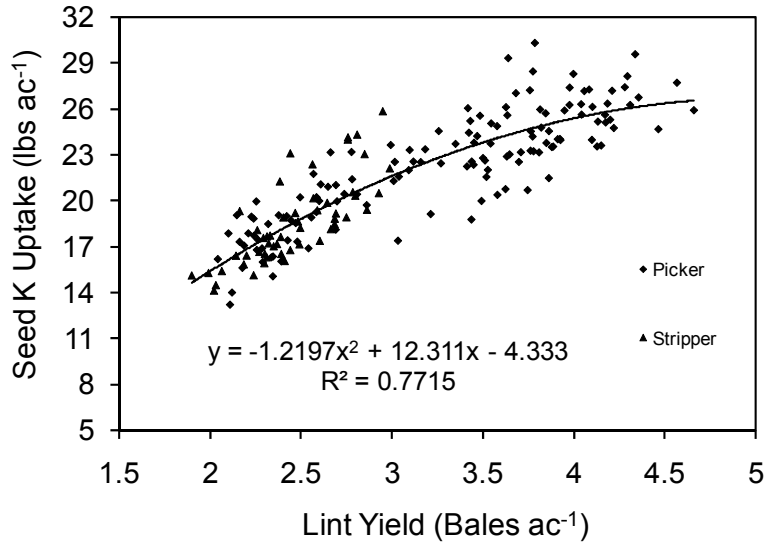

Fig. 3. Regressions of K seed uptake in cotton seed vs. lint yield

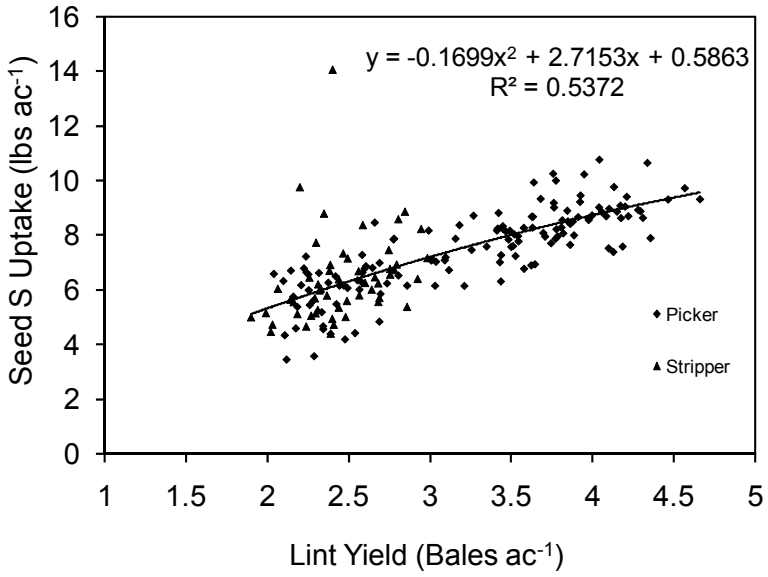

Fig. 4. Regressions of S seed uptake in cotton seed vs. lint yield

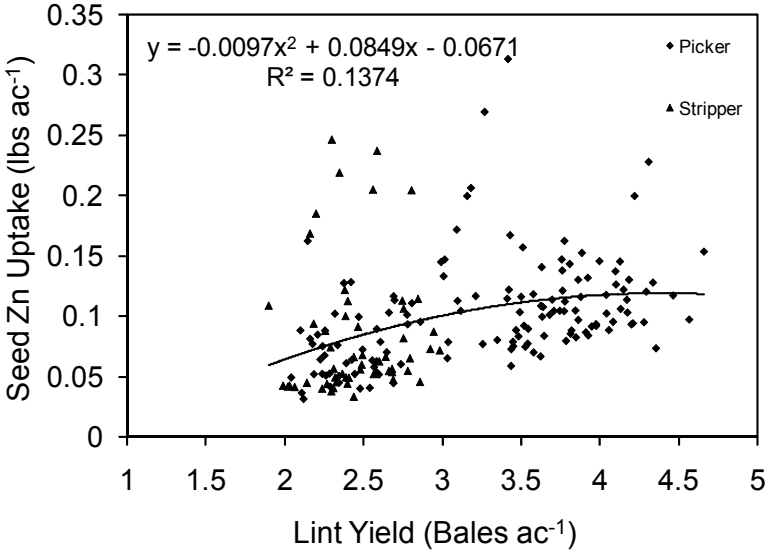

Fig. 5. Regressions of Zn seed uptake in cotton seed vs. lint yield

Conclusions

- This study provides useful information on macro and micronutrient uptake by cotton seed across a large range of lint yields.
- Greater lint and seed yields with picker cotton compared to stripper is related to higher nutrient uptake, however seed nutrient uptake bale^{-1} did not differ by variety.
- The seed nutrient removal rates bale^{-1} in this study provide useful guidelines for maintenance nutrient management, e.g. for potassium and for nutrient budgeting.

References

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