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# ENGINEERING

## Increasing Picker Efficiency by Using a Boll Saver Attachment

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### INTERPRETIVE SUMMARY

Tests were conducted for 3 yr to evaluate the effectiveness of a new picker-mounted harvesting aid called the Boll Saver, which was developed by the Hydrapak Corp., Morgan, GA, to reduce cotton picker harvest losses. The device was installed on a John Deere 9900 spindle picker and tested using eight cotton varieties. In all 3 yr, cotton was picked later than an ideal time for harvest. There were no significant differences in trash content between samples picked with and without Boll Saver, except for in Stoneville 474 cotton (3.2% with vs.1.9% without the attachment). The Boll Saver had no effect on lint turnout within a given cotton variety. Use of the attachment significantly reduced ground and total harvest losses for all cotton varieties. Savings in lint cotton ranged from 24 lb/acre to 53 lb/acre. In 1996, stalk losses were significantly less with the attachment except for Suregrow 125 and Deltapine 51.

### ABSTRACT

**Cotton harvest losses due to delayed picking after defoliation and out-of-adjustment pickers can be as high as 20%. This study was conducted to determine the effects of a new harvest aid attachment, called the Boll Saver (which was developed by the Hydrapak Corp., Morgan, GA), on harvest losses as affected by cotton variety and adverse harvesting conditions in South Carolina. Replicated tests were conducted for 3 yr (1994–1996) during harvest seasons at the Edisto Research and Education Center near Blackville, SC. In all 3 yr, cotton was picked later than an ideal time for harvest. The two middle rows of each plot were machine harvested for yield determinations of eight varieties of cotton, either with or without the Boll Saver attachment. In all 3 yr, stalk and ground losses, percent lint turnout, and yield from each plot were measured. Use of a Boll Saver attachment significantly reduced ground and total harvest losses during the three harvests for all cotton varieties. Savings in lint cotton ranged from 27 to 59 kg ha$^{-1}$. There were no significant differences in trash content between samples picked with and without the Boll Saver attachment in 1996, except in Stoneville 474 cotton which had lower trash content without the attachment. The Boll Saver attachment had no effect on lint turn out within a given cotton variety. In 1996, stalk losses were significantly less with the Boll Saver attachment except for Suregrow 125 and Deltapine 51.**

Ideally, cotton harvest should be completed within 30 d after a defoliant is applied. Many times this cannot be accomplished due to adverse weather conditions. Cotton that is rained upon and wind blown following defoliation often is "strung out" (lint loosely extended outside of boll) and harder to pick. Even without adverse weather, cotton begins to string out with time, which will result in some of the cotton falling to the ground during harvest. This, combined with poorly managed, out-of-adjustment pickers, could result in harvesting losses as high as 20% (Bader, 1996).

Harvest losses may be in the form of cotton left on the plants by the harvester (stalk losses) or cotton dropped by the harvester (ground losses), (Kepner et al., 1978, p. 459). A new piece of equipment developed by the Hydrapak Corp., Morgan, GA, can help cotton growers reduce losses during harvest. This attachment, called the Boll Saver, mounts under the front drums of the picker, and replaces the bottom ribs of the drum in a configuration that leaves the ribs and Boll Saver in the same line vertically. The Boll Saver attachment redirects the air flow at the picker head and blows the cotton back around the spindles, giving them another chance to grasp it, greatly reducing the

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amount of cotton that falls onto the ground. Models are available for all John Deere and Case-International 2-, 4-, and 5-row pickers.

In a preliminary study in Georgia, the Boll Saver increased the amount of seed cotton picked (Jones, 1995). Bader (1996) conducted five experiments in Georgia, with and without the Boll Saver attachment on three different cotton pickers. Reduction in picking losses ranged from 7.7 to 73.2 kg $ha^{-1}$ seed cotton with an average of 33.1 kg $ha^{-1}$ seed cotton loss reduction for the five experiments.

Both tests in Georgia were conducted under normal picking conditions. It would be reasonable to expect even greater differences for cotton that is damaged by adverse weather conditions. Our study was conducted to determine the efficiency of the Boll Saver attachment for reducing harvest losses, as affected by cotton variety and adverse harvesting conditions in South Carolina.

## MATERIAL AND METHODS

Two Boll Saver units were installed under the front drums of a two-row JD-9900 spindle picker. The attachment, which has no moving parts, contains an air manifold and air supply boots. The air manifold, made of a 2.5-cm diam. steel pipe, contains holes (0.3 cm diam., 1.9 cm apart) facing different directions on the top of the manifold. It also has a clean-out valve at the end of the pipe (Fig.1) that can be opened while the picker fan is running to blow out sand and trash.

Each air manifold unit is bolted to the bottom of the picker. Upward air flow from the air manifold reduces the amount of seed cotton that falls on the ground and helps to detach that cotton left behind by the picker.

Each air manifold unit is welded to a skid plate that rides close to the soil surface (Fig.1) to protect the manifold.

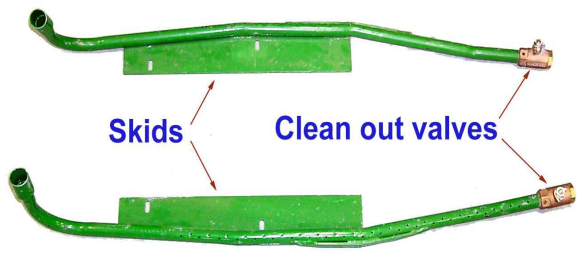


**Fig. 1. The Boll Saver's air manifolds, clean out valves, and skids.**

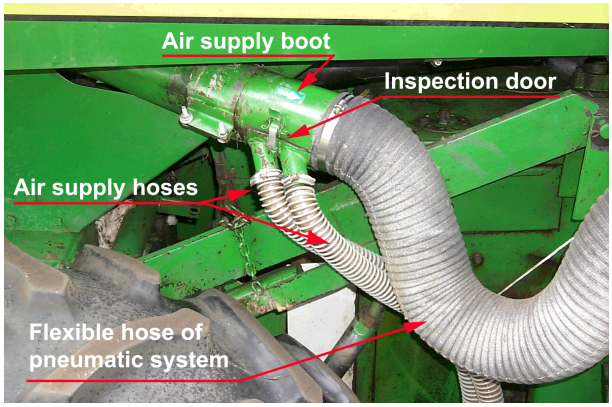


**Fig. 2. Air supply boots and hoses connected to the flexible hose of the picker's pneumatic conveyor system.**

Air supply boots for 2-row pickers have a single 3.8-cm diam. hose shank, while boots for 4-row pickers have a double 3.8-cm diam. hose shank (Fig. 2). Air boots are connected to the pneumatic conveying system's flexible air hoses at the sides of the cotton picker. A 3.8-cm hose connects the air manifold to the air supply boot. Air boots are equipped with an inspection door, which allows the operator to ensure that no lint or trash is obstructing the air flow (Fig. 2).

For our study, the picker was modified by replacing the storage basket with a platform and adding a sacking attachment to the discharge end of the pneumatic conveying system, all of which allowed us to collect our small-plot (30 m or less in length) yield samples in burlap sacks.

Tests were conducted for 3 yr (1994–1996) at the Edisto Research and Education Center near Blackville, SC. Eight varieties of cotton were grown using recommended production practices for seedbed preparations, seeding rate, fertilization, and insect and weed control (Lege' et al., 1996). The only deviation from recommended practices was that in all 3 yr, cotton was picked 10 to 15 d later than an ideal harvest time, which caused it to be strung out. (Cotton is normally picked within 30 d after defoliation; we picked 40 to 45 d after defoliation.)

In 1994 and 1995, plots consisted of four rows 30 m long, on 96-cm centers replicated four times. Cotton varieties were Deltapine 90 in 1994 and Deltapine 5415 in 1995. The two middle rows of each plot were machine harvested with or without Boll Saver, for yield determinations.

**Table 1. Effects of Boll Saver attachment on Deltapine 90 cotton yield and stalk and ground losses (kg lint ha$^{-1}$), 1994. Edisto Research and Education Center, Blackville, SC.**

| Treatment | Yield | Stalk losses | Ground losses | Total losses | (%) losses |
|---|---|---|---|---|---|
| With Boll Saver | 1351 a† | 64 a | 48 b | 112 b | 8 b |
| Without Boll Saver | 1269 a | 74 a | 78 a | 152 a | 12 a |

† Means within a column with a letter in common are not significantly different ($P$ = 0.05).

In response to growers' questions, additional varieties were added to the experiment by the authors in 1996, the year trash measurements were taken.

Six varieties were planted in 1996—Suregrow 125, Stoneville 474, Suregrow 501, Deltapine 5415, Stoneville LA887, and Georgia King. Plot size was four 15-m long rows (96-cm spacing). Each test was replicated four times.

So that we could accurately measure stack and ground losses, each plot was hand raked prior to initial picking and any cotton on the ground was picked up so that the plots were absolutely clean.

After machine harvesting the two middle rows, a 3-m section of each plot was established and any cotton left on the ground was collected and weighed to determine ground losses. In addition, cotton remaining on the stalk was also hand picked and weighed to determine stalk losses. Subsamples were taken from individual plots, ginned for percent lint turnout, and the lint from each sample was analyzed for trash content by the USDA classing office.

**Table 2. Effects of Boll Saver attachment on Deltapine 5415 cotton yield and stalk and ground losses (kg lint ha$^{-1}$), 1995. Edisto Research and Education Center, Blackville, SC.**

| Treatment | Yield | Stalk losses | Ground losses | Total losses | (%) losses |
|---|---|---|---|---|---|
| With Boll Saver | 1368 a† | 73 a | 83 b | 156 b | 11 b |
| Without Boll Saver | 1335 a | 80 a | 115 a | 195 a | 15 a |

† Means within a column with a letter in common are not significantly different ($P$ = 0.05).

## RESULTS AND DISCUSSION

Table 1 shows effects of the Boll Saver attachment on cotton yield, stalk losses, and ground losses for 1994. No significant difference was seen in cotton yield or in stalk loss. There was a significant difference in ground loss, though, 78 kg lint ha$^{-1}$ lost without the Boll Saver, vs. 48 kg lint ha$^{-1}$ lost with the attachment. Total loss was 152 kg lint ha$^{-1}$ (12%) without the attachment and 112 kg lint ha$^{-1}$ (8%) with it. Lint turnout was 41% with both samples. The 35 kg lint ha$^{-1}$ saving was slightly higher than the data reported from Georgia for the same year under normal harvesting conditions.

Table 2 shows the results for the 1995 test. Again, there was a significant difference in ground loss (115 kg lint ha$^{-1}$ vs. 83 kg lint ha$^{-1}$) and total loss (195 kg lint ha$^{-1}$ vs. 156 kg lint ha$^{-1}$) between the plots picked without and with the Boll Saver.

Table 3 shows the effects of the attachment on trash content, ground losses, yield, and stalk losses for different cotton varieties for the1996 test. There

**Table 3. Effects of Boll Saver attachment on trash content, cotton yield, and stalk and ground losses (kg lint ha$^{-1}$), for different cotton varieties, 1996. Edisto Research and Education Center, Blackville, SC.**

| | Suregrow 125† | | Stoneville 474 | | Suregrow 501 | |
|---|---|---|---|---|---|---|
| | W | WO | W | WO | W | WO |
| Trash (%) | 2.9 a‡ | 3.2 a | 3.2 a | 1.9 b | 3.2 a | 3.2 a |
| Lint (%) | 39.4 a | 37.5 a | 41.2 a | 41.8 a | 40.5 a | 40.5 a |
| Yield | 992 a | 892 a | 1073 a | 1002 a | 1055 a | 944 a |
| Ground losses | 25 a | 50 b | 27 b | 53 a | 28 b | 52 a |
| Stalk losses | 39 a | 61 a | 34 b | 58 a | 32 b | 65 a |
| Total losses | 64 b | 111 a | 61 b | 111 a | 60 b | 117 a |
| % loses | 6 b | 12 a | 6 b | 12 a | 6 b | 12 a |
| | Deltapine 51 | | Stoneville LA887 | | Georgia King | |
| Trash (%) | 1.3 a | 1.3 a | 2.3 a | 2.3 a | 2.6 a | 2.8 a |
| Lint (%) | 38.1 a | 38.3 a | 41.1 a | 41.3 a | 38.3 a | 38.6 a |
| Yield | 982 a | 864 a | 942 a | 915 a | 970 a | 927 a |
| Ground losses | 23 b | 58 a | 28 b | 45 a | 20 b | 41 a |
| Stalk losses | 51 a | 75 a | 47 b | 57 a | 48 b | 68 a |
| Total losses | 74 b | 133 a | 75 b | 102 a | 68 b | 109 a |
| % loses | 8 b | 15 a | 8 b | 11 a | 7 b | 12 a |

† W, and WO = With, and Without the Boll Saver attachment.

‡ Values in a row, within a variety, followed with the same letter are not significantly different ($P$ = 0.05).

were no significant differences in trash content between samples picked with and without the attachment, except for Stoneville 474 (3.2% with vs. 1.9% without the attachment). The Boll Saver had no effect on lint turn out within a given cotton variety. Use of the attachment significantly reduced ground losses for all varieties. Except for Suregrow 125 and Deltapine 51, stalk losses were significantly less with the Boll Saver. Savings in lint cotton ranged from 27 kg $ha^{-1}$ for Stoneville LA887 to 59 kg $ha^{-1}$ for Deltapine 51.

## CONCLUSIONS

1. Use of a Boll Saver attachment significantly reduced ground and total harvest losses during 1994 to 96 harvest for all cotton varieties. Savings in lint cotton ranged from 27 to 59 kg $ha^{-1}$.
2. There were no significant differences in trash content between samples picked with and without the Boll Saver in 1996, except for in Stoneville 474 which had higher trash contents.
3. The Boll Saver had no effect on lint turnout within a given cotton variety.
4. In 1996, stalk losses were significantly less with the attachment except for Suregrow 125 and Deltapine 51.

## ACKNOWLEDGMENTS

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## REFERENCES

Bader M.J. 1996. Results from Boll Saver tests. p.1650. *In* P. Dugger and D.A. Richter (ed.). Proc., Beltwide Cotton Prod. Res. Conf. Nashville, TN. 9–12 Jan. 1996. Natl. Cotton Council Am., Memphis, TN.

Jones, K. 1995. Boll Saver (cotton picker attachment). p. 49–50. *In* D.A. Richter and J. Armour (ed.). Proc., Beltwide Cotton Prod. Res. Conf. San Antonio, TX. 4–7 Jan. 1995. Natl. Cotton Council Am., Memphis, TN.

Kepner R.A., R. Bainer, and E.L. Barger. 1978. Principles of farm machinery, 3rd. ed. AVI Publishing Co., Inc. Westport, CT.

Lege' K.E., M.E. Roof, J.J. Camberato, E.C. Murdock, J.D. Mueller, G.D. Christenbury, and C.E. Curtis. 1996. South Carolina cotton growers guide, EC589, Clemson Univ.