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Introduction

Ear rots, caused by a variety of different fungi, are an annual problem in corn growing regions of the United States. Several of the fungi that cause these ear rots are capable of producing toxic compounds called mycotoxins that can accumulate in moldy ears and in stored grain, greatly reducing the grain's quality. Mycotoxins also pose a health hazards to humans and animals.



Fig. 1: Aspergillus ear rot on corn

It is important for Extension personnel to understand current perceptions of mycotoxins and be aware of what management practices are implemented at the farmer level. Therefore, various surveys were distributed in 2012, 2014, and 2015 at University Extension meetings to assess:

1. Attitudes and knowledge of farmers and industry personnel in Indiana, North Carolina, and Texas about mycotoxins

1. Management techniques currently being utilized by farmers for ear rot diseases and mycotoxins

1. Techniques farmers are willing to try in the future

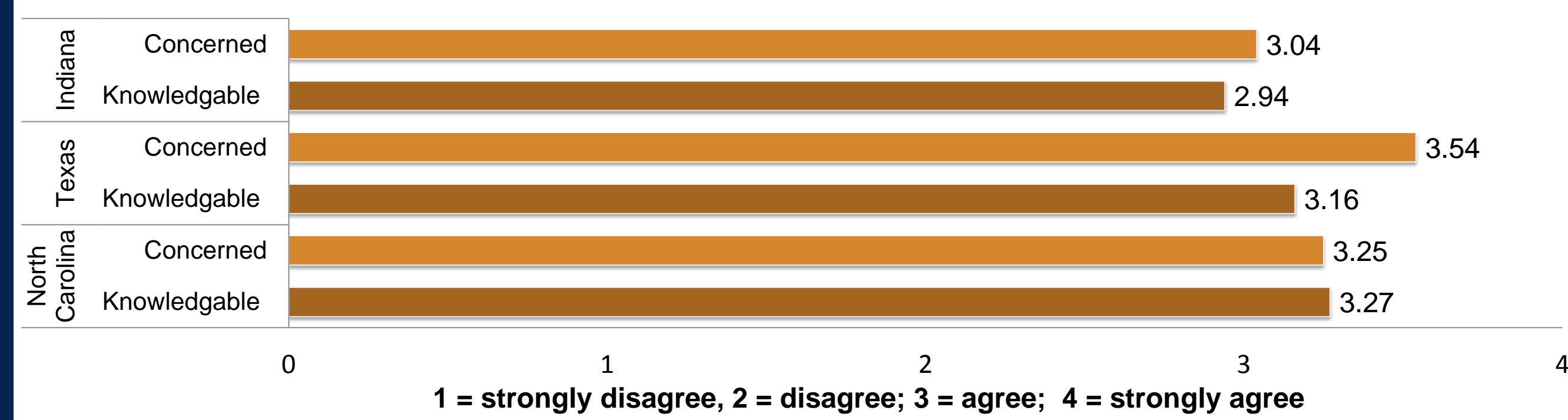
2. How best to disseminate new information on mycotoxin management

Attitudes and Knowledge

In 2012, agricultural personnel were asked to rate their level of concern about mycotoxins as well as their perceived knowledge level based on a Likert scale. Respondents were also able to choose "Not sure", and these responses were excluded when calculating a response mean (Table 1).

Three years later [do you mean in 2015?], respondents in Texas and Indiana were asked if they believe that ear rots are a significant problem that they need to actively manage. In Indiana 63% responded "yes", with 53% responding that they were either concerned or moderately concerned. In Texas 73% responded "yes". 44% of those in Texas answered that they were very concerned and 28% indicated that they were moderately concerned.

Table 1: Concern levels and perceived knowledge levels of survey respondents about mycotoxins in their/ their client's corn - 2012



Management Techniques

Current Management Techniques:

In 2012, survey respondents in Indiana, North Carolina, and Texas were asked if they currently used Afla-Guard to help prevent the accumulation {do you mean reduce the risk of?} of mycotoxins in corn and, if not, would they consider using this technique in the future. None of the respondents in Indiana or North Carolina indicated that they had used Afla-Guard, but in Texas 65% or respondents had tried this technique [in table you used non-toxicogenic. Here you are using aflaguard and technique]. 65% of the respondents in Indiana said that they would be willing to try it [be sure we know what "it" is] in the future, though, as did 71% of those in North Carolina, and 87% of those who had answered "no" to the first question in Texas.

In 2015, surveys were conducted in Indiana and Texas to assess which of a series of management techniques are currently being used. Respondents were also asked how well they perceived each technique to work. A Likert scale where 1 = Not effective at all and 4 = very effective (Table 2) was used to quantify their responses.

Technique	Have you used this technique? (% "yes")	Effectiveness Ratings		Have you used this technique? (% "yes")	Effectiveness Ratings	
		Mean	# responses		Mean	# responses
Use of hybrids resistant to ear rots	78	3.42	12	88	3.07	14
Use of a non-toxicogenic strain for aflatoxin management (ex: Afla-Guard)	29	3.25	8	76	3.57	14
Avoid or reduce plant stress through irrigation	14	3.2	10	13	2.5	12
Harvest affected fields early	63	2.92	13	25	2.5	12
Dry grain below 15% moisture immediately after harvest	100	3.2	15	67	2.67	12
Tillage to reduce previous crop	86	3.07	14	63	2.92	12
Foliar fungicide application	25	3.11	9	18	2.25	8
Other: Stopped growing food grade corn	-	-	-	100	-	-

Table 2: Management techniques currently used in Indiana and Texas to manage ear rot and mycotoxins in corn. The mean is based off a Likert scale where 1= Not effective at all and 4 = very effective. "Don't know" was also given as an option but was not considered in the calculation of the mean.

Future Management Techniques:

The 2012 survey also asked if respondents would consider using a corn hybrid with genetically modified mycotoxin (aflatoxin and/or fumonisin) resistant traits. Then, in 2015, respondents in Indiana and Texas were asked how much more money they would be willing to spend on a hybrid with broad and effective resistance to ear rots and mycotoxins, assuming other positive traits remain the same (Figs. 2 and 3).

Fig. 2: Percentage of respondents in 2012 who would consider using a genetically modified corn hybrid with mycotoxin resistant traits

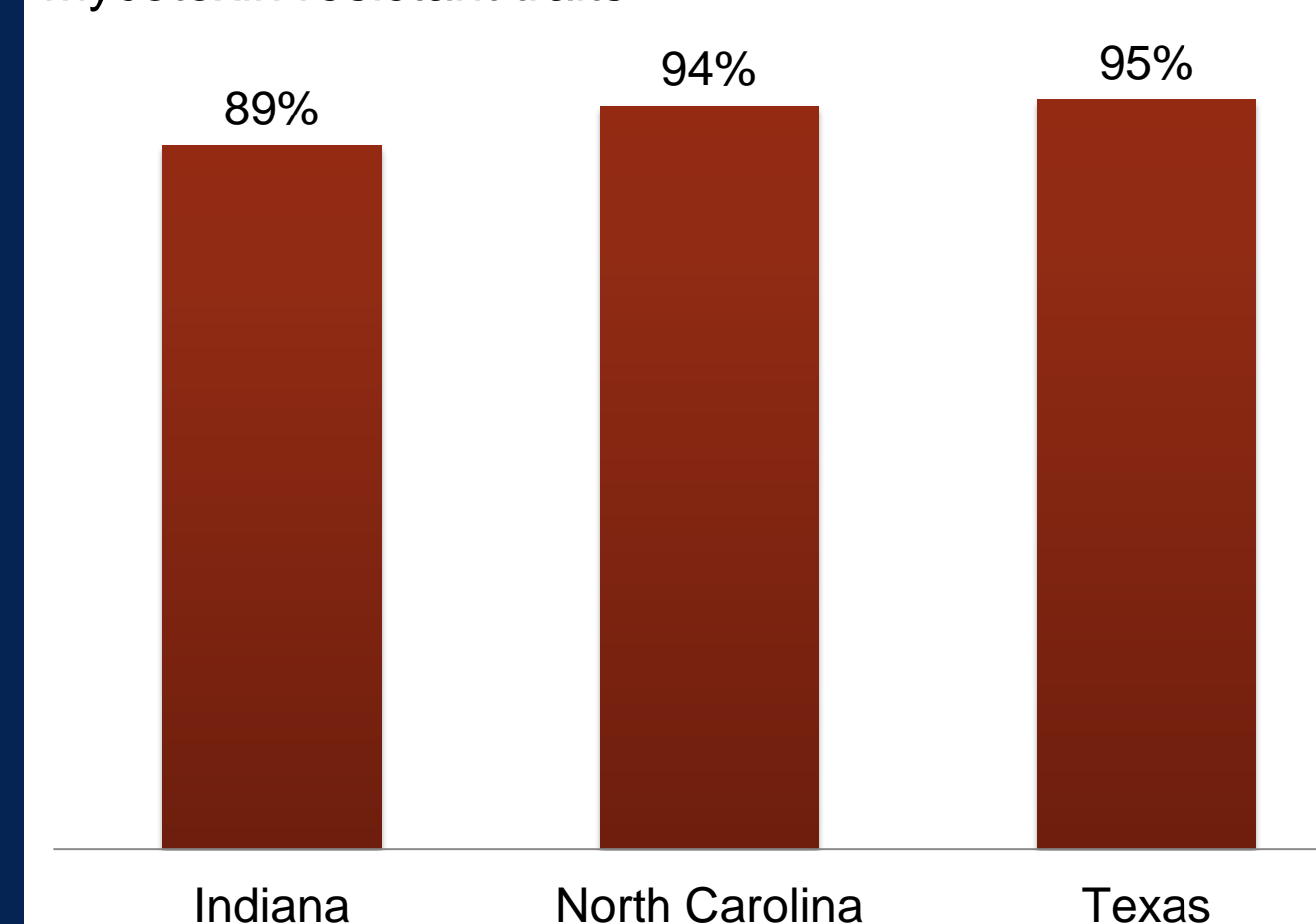
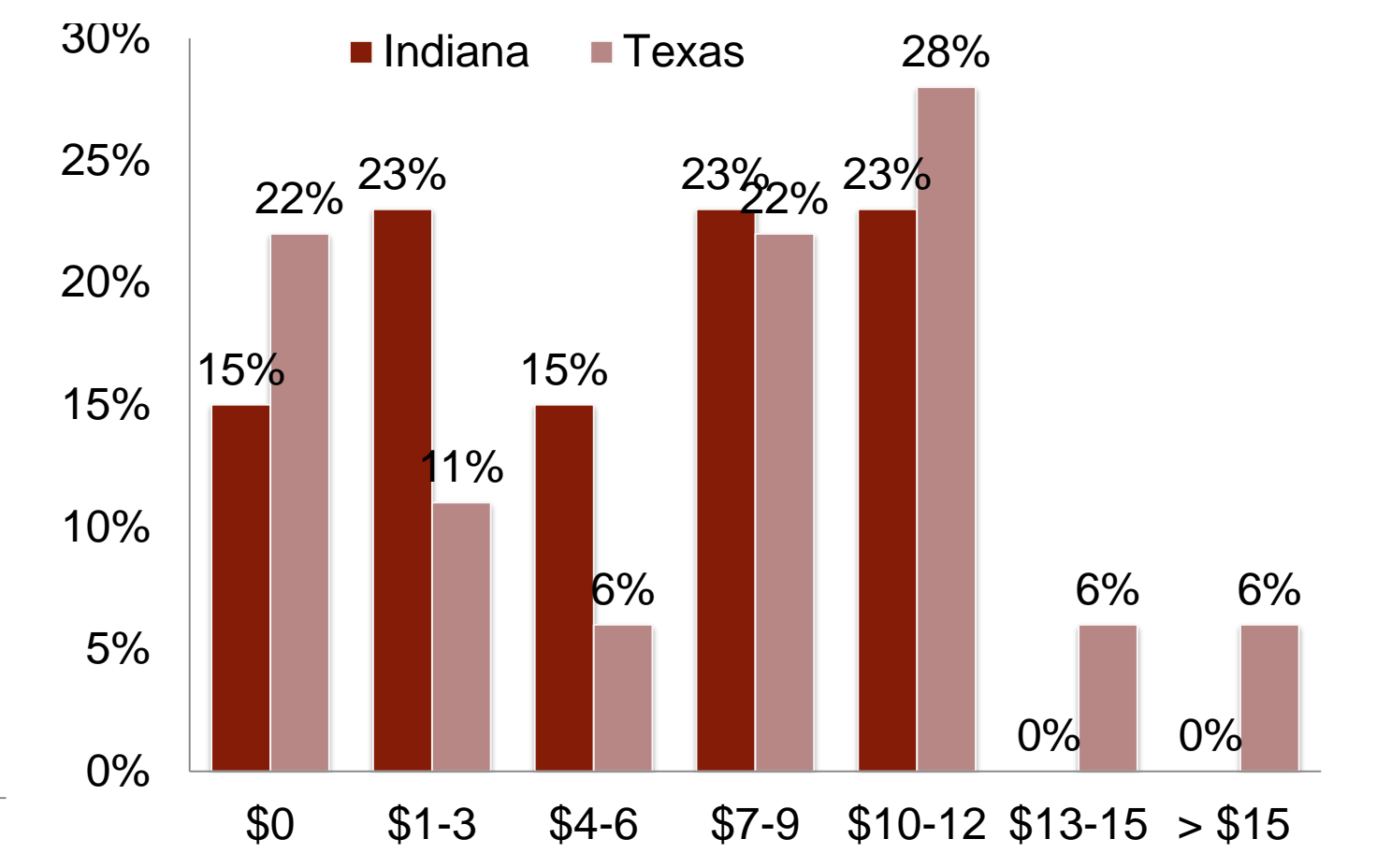


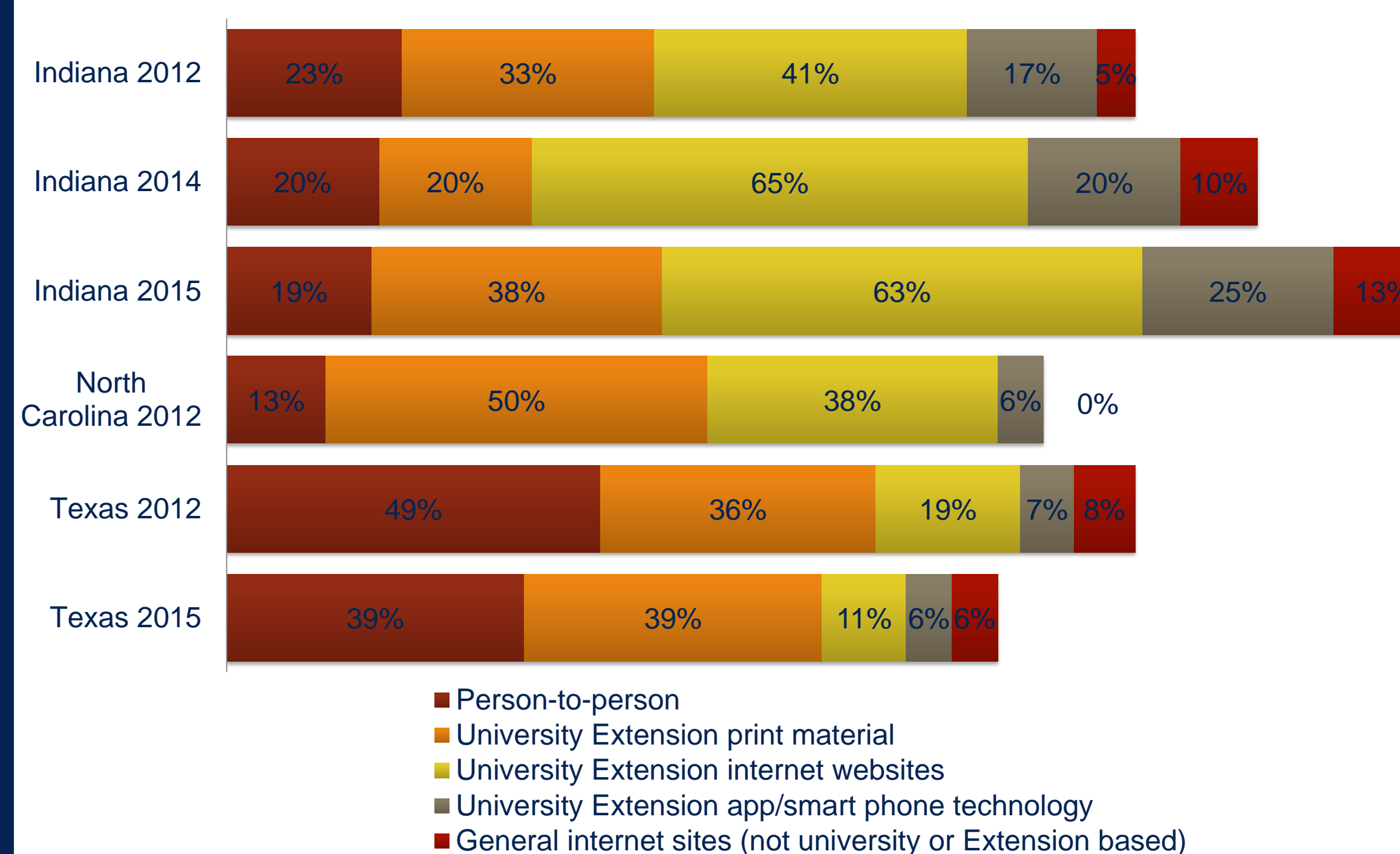
Fig. 3. Extra cost respondents would be willing to incur per bag for a hybrid with ear rot/ mycotoxin resistance in 2015 in Indiana and Texas.



Communicating Information

In every survey from 2012, 2014, and 2015, respondents were asked about the best way for them to receive new Extension information on ear rots and mycotoxins (Table 5).

Figure 5: What is the best way for you to receive new information about ear rots/ mycotoxins?



Conclusions

- Overall, concern levels about mycotoxins are high across Indiana, North Carolina, and Texas. Perceived knowledgeability is also high but typically lags behind concern levels across state means.
- Many different management practices are being used to reduce ear rots and mycotoxins, all with relatively high perceived efficacy. Texas is leading in the adoption of Afla-Guard. Use of resistant hybrids is common, as is drying grain to below 15% moisture immediately after harvest.
- All states surveyed are highly interested in new management practices that would help control ear rots and mycotoxins. This includes using a genetically modified hybrid. Although some people would not be willing to pay a higher price for these resistance traits, most of the respondents would be willing to pay several dollars extra per bag.
- We need to continue providing research updates and new management recommendations in many formats (in person, print, web, app, etc.) to access the widest audience possible.

Extension plays a large role in dissemination information on ear rots and mycotoxins, and the results of this survey will help Extension professionals more effectively address knowledge and information gaps present in the constituency of our respective states.

Acknowledgements

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