The Peanut Shell as a Barrier and Target in Breeding Peanut to Resist Aflatoxin

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After the severe late-season drought accompanied by high temperatures in 2019 that resulted in record levels of aflatoxin contamination in the southeastern US peanut crop, the peanut industry responded with a renewed initiative to minimize aflatoxin. Breeding cultivars that can resist aflatoxin has long been a goal, because, if achieved, resistant cultivars would be widely deployable and apparently stable means to reduce aflatoxin in eatable peanuts. Since the early 1970's researchers have worked to identify and develop resistant germplasm and cultivars. In a 2009 review article summarizing efforts at ICRISAT, the authors concluded "The lack of high levels of resistance to aflatoxin contamination in the cultivated peanut germplasm places a ceiling on the progress that can be made following conventional approach in resistance breeding."(1). It is clear that there are gains to be made in developing peanut genotypes that resist *Aspergillus*, but it is also clear that the task is complicated. Early work in breeding for aflatoxin resistance focused on the seed coat as a barrier to aflatoxin contamination (2) and identified two PI lines with significantly reduced *Aspergillus* contamination. Testa attributes that have been linked to resistance (4) include physical ("thickness and density of palisade layers, presence of wax layers, and absence of fissures and cavities" [from 1]) as well as chemical (tannin [3,4]) attributes. Subsequent work investigated the pod shell as a barrier to aflatoxin contamination (5). From this work they concluded that the pod shell was an effective barrier to *Aspergillus* colonization of the seed, but there were complicating factors including GxE that made it difficult to pinpoint the pod shell as a primary target for breeding for resistance to aflatoxin. Others have commented that changes in the pod aimed to reduce *Aspergillus* contamination might be detrimental to shelling characteristics that would render the cultivars economically non-viable (from 1). However, the potential for chemical and physical changes in pod shell and that could aid in resisting *Aspergillus* have not been investigated. Chemical properties of the pod shell could obviate potential detrimental physical changes and or complement minor changes in the physical properties of the shell that could be an acceptable tradeoff if aflatoxin contamination were reduced. This presentation will summarize the literature regarding breeding for aflatoxin resistance relative to pod characteristics in peanut and theorize about gaps in knowledge that may be investigated.

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