Grain irradiation and mould toxins

Mould problems

We all know that moist goods get mouldy after some time. Moulds grow from tiny spores floating in the air, which are so tiny that they are invisible to the naked eye. When they land onto a surface they germinate if the circumstances of moisture, nutrients and temperature are right.

All agricultural commodities are full of mould spores and the best way of dealing with them is by keeping things dry. Unfortunately this is not always possible due to rain during harvest, poor storage facilities or problems during transport. As a result it occurs frequently that people and cattle eat mouldy food. This can be dangerous as many moulds produce powerful toxins.

The aflatoxins are well known from mouldy peanuts, but you can find them on any mouldy surface. Most toxins are produced by the Aspergillus, Penicillium and Fusarium moulds.

Grain irradiation

One of the applications of food irradiation would be irradiation of grain as a means of insect disinfestation. The dose recommended by the Joint Expert Committee for this purpose was 0.75 kGy (1). This means in practice a dose range of 60 to 90 kGy.

When microbiologists started to understand what food irradiation was, they also started to understand some of its implications. If grain were to be irradiated, then mould spores were irradiated with it. And what effect would this have on the moulds grown from these irradiated spores? So, they set out to investigate this.

Mould spore irradiation

They focused on the spores of toxin producing Aspergillus moulds: the aflatoxin producers. These were irradiated at different irradiation doses and then grown on a number of suitable substances like wheat germ, cracked wheat, rice, bread and so on. Then the amount of produced toxin was measured and compare with the toxin produced from unirradiated spores of that same mould grown under the same circumstances.

Upsurge in toxin formation

It was found that moulds grown from irradiated spores produced much more toxin than moulds from unirradiated spores. The most alarming finding was that this occurred precisely in the narrow irradiation range available for insect disinfestation. This is the range of 0.50 kGy to 1 kGy as beyond 1 kGy the viability of the irradiated grain is at stake.

Not only more toxin was formed, but from 0.50 kGy onwards a **steep upsurge** of toxin production occurred (2, 3).

When this research was repeated with other toxin producing moulds the same picture emerged: gamma irradiation stimulated toxin production (4, 5, 6, 7, 8).

Fake research

The standard answer from the promoters of food irradiation was fake research. And lo and behold they did not find an upsurge in toxin production. What did they do? They used oxygen deprivation to reduce toxin production, they used irradiation doses below 0.50 kGy (but this dose is not sufficient for insect disinfestation) and one "research" used even a mould inhibitor. In addition they misrepresented the genuine research. For example there is this research from Schindler et al.(3) that found that the peak production of aflatoxin of a particular toxin producing mould was at a dose of 0.90 kGy. Then the graphic went fairly steep down till around 2.25 kGy followed by a very steep decline till 4.3 kGy when toxin production ceased.

Misrepresentation

The promoters reviewed this research and wrote that the highest toxin production was at an irradiation dose of 4.3 kGy (9). This is well outside the insect disinfestation range and would be of no concern to anyone.

The problem of these reviews is that they are relied on by experts not doing their homework by looking up the original research papers. And here comes fake research in. The large number of reports from fake research causes a flood of research papers and most scientists have not the time to go through them. So they rely on reviews assuming that they are reliable.

In other words decisions made by so called experts are often based on misinformation that is cleverly and deliberately put in place.

Conclusion

Irradiation of grain and other commodities against insect infestation would create more problems, than it would solve.

References

1. WHO Technical Reports Series No.451, p.15 (1970).
2. Jemmali, M. et al. 1969. Influence of gamma irradiation of A. flavus spores on the production of Aflatoxin B1. C.R. Acad. Sc. Paris, 269 (D): 2271-2273.
3. Schindler, A.F. Et al. 1980. Enhanced aflatoxin production by A. flavus and A. parasiticus after gamma irradiation etc. J. Food Protect. 43: 7-9.
4. Applegate, K. L et al. 1973. Increased aflatoxin production by A. flavus via cobalt irradiation. Poultry Science 52: 1492 - 1496.
5. Applegate, K .L et al. 1973. Increased aflatoxin production etc. Mycology 65: 1266 - 1273.
6. Applegate, K. L. et al. 1974. Effects of Co-60 gamma irradiation on etc. Mycology 66: 436 - 445.
7. Applegate, K. L. et al. 1974. Daily variations in etc. J. Appl. Bact. 37: 359 - 372.
8. Applegate, K. L. et al. 1976. Production of ochratoxin A by A. ochraceus etc. Appl. Environ. Microbiol. 31: 349 -353.
9. Teufel, P. 1983. Microbiological Aspects of Food Irradiation in: Recent Advances in Food Irradiation (eds P.S. Elias and A.J. Cohen) by Elsevier Biomedical p. 217.

H. Julius

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