SIGNIFICANCE OF ETHYL FORMATE IN CONTROLLING THE FUNGAL GROWTH IN STORED GRAINS

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Ethyl formate is a naturally occurring volatile compounds and is being evaluated as fumigant for stored grains as it is potential alternative to the ozone-depleting fumigant methyl bromide and to phosphine and is reported to have either antimicrobial or insecticidal properties. Moisture level, physical conditions of grain storage practices and environmental conditions influence the susceptibility of grain feed stuff to *Aspergillus parasiticus*, a common fungal infestation and hence drying to safe moisture contents is essential to prevent initiation of fungal activity. As long as it is present in the feed stuff, it prevents feed from microbial attack. Ethyl formate is successfully used for individual per package fumigation of dried fruits since a long time.

Freshly harvested grains of pearl millet, cotton, guar, groundnut, mustard, paddy, wheat, sunflower and chickpea which are commonly used as animal feed in one form or others were collected from different farmer's field. The natural level of ethyl formate were analysed from these samples on 'Nucon' type gas chromatography (GC) equipped with flame ionization detectors (FID) and DB FFAP capillary column after extraction with propanol and methanol. Column conditions were isothermal for analysis of ethyl formate. The temperature was maintained at 70^{o} C. Moisture content observed in various feed commodities ranged between 8.5 to 14.5 %. The natural levels of ethyl formate extracted with propanol ranged from 0.22 to 0.70 ppm and from 0.22 to 0.68 ppm with methanol in whole commodities samples. Similarly, natural levels of ethyl formate extracted with propanol ranged from 0.30 to 0.69 ppm and from 0.26 to 0.67 ppm with methanol in ground commodities samples. It was also observed that ethyl formate in ground samples were better extracted than in whole commodities by virtue of it the ethyl formate content was found significantly higher ($P<0.05$) in ground samples than whole commodities. However, extraction with propanol shown better results than methanol. Ethyl formate was present in grains at harvest and increased during the first month of storage, and then began to decline, particularly at temperature higher than 25^{o} C and with the time of storage.

A method was standardized to determine the minimum concentration of ethyl formate required for inhibition of *A. parasiticus* by using solid as well in liquid potato dextrose agar medium. No inhibition of *A. parasiticus* was observed on potato dextrose agar petri plates supplemented with different concentrations (200 to 2000 ppm) of the ethyl formate after incubation at 37^0C for 48 to 72 hours because of the volatile nature of ethyl formate. Thus the method was standardized in liquid medium by putting the suba seals on the flask to prevent the evaporation and it was observed that there was 21.1 and 90.2 % inhibition at 200 and 400 ppm concentration of ethyl formate, respectively, as compared to control and no growth of fungus was observed after 600 ppm concluding that minimum concentration of ethyl formate to inhibit *A. parasiticus* was 600 ppm. The natural occurrence and dynamic nature of the levels of ethyl formate should be considered when establishing maximum residual limit (MRL) that are compatible with natural levels.