View metadata, citation and similar papers at core.ac.uk
brought to you by CORE
provided by JKI Open Journal Systems (Julius Kühn-Institut)

guianencis L.) to control/repel that Hemiptera from the fruits (thus replacing chemical insecticides exposure). Andiroba oil and assai fruits utilized were from Belem city, Para state, Northern region of Brazil. They were divided into 2 main groups: treated (Treated Group - TG) and not treated (Control - C). The TG was sub-divided into TGI, TGII, TGIII, TGIV and TGV for the application of oil at different concentrations (10, 25, 30, 50 e 100%, respectively) and time of exposure (n=3). After oil treatment under controlled environment, the assai fruits insects were left standing 24 h, with their behavior variation observed (each 2 h) and the most effective concentration registered by decreasing order of efficacy was selected. As expected, on the assai surfaces`, the insect movements (distance) and speed reduced with the percentage of dead ones reaching to 100% as the oil concentration raised. The Andiroba oil green method could be a safe treatment to be utilized for assai insect infestation (instead of chemical insecticides) as the whole fruit is utilized n the de-pulping process.

Colour changes in pulses fumigated with different metal phosphide formulations

Gerhard Jakob[1]*, Renate Steuerwald[1], Dennis Ryman[1]

[1]Detia Freyberg GmbH, Dr.-Werner-Freyberg-Str. 11, D-69514 Laudenbach
*Corresponding Author: G. Jakob (gerhard_jakob@detia-degesch.de)
DOI 10.5073/jka.2018.463.208

Abstract

Many phosphine-emitting products are used globally to control insect pests in dried vegetables, grains and pulses. However, variation in phosphide formulations is associated with colour change in many pulses. This study evaluated the effect of fumigation using Mg_3P_2 containing ammonium carbamate; AlP containing no ammonium carbamate and pure ammonium carbamate on colour of diferrent pulses. Different pulses showed different reactions towards fumigation with phosphine. A distinctly darker discolouration was observed in broad beans and lentils when fumigated with ammonium carbamate containing Mg_3P_2 and pure ammonium carbamate, whereas there were no apparent colour changes in white kidney beans, soybeans and green peas. The use of ammonium carbamate-free AlP resulted in no changes in any of the pulses. Therefore, formulation type of the phosphine product plays a major role in the visible colour change of the pulses.

Keywords: phosphine, ammonium carbamate, pulse varieties, colour change

Introduction

In many fields of stored product protection one of the most important substances in use worldwide to control stored product pests is the fumigant phosphine. The most established method of distribution is the use of solid-based aluminium phosphide and magnesium phosphide products in the form of tablets, pellets, bags or plates. After distribution, existing stored product moisture or ambient moisture contribute to the release of the actual active substance itself: phosphine gas. The advantages of this gas are its excellent penetrative ability and its extraordinarily high rate of efficiency against all stock-damaging insects. In this respect, all developmental stages of storage insect pests can be easily controlled; these properties even deal reliably with those developmental stages living hidden within the stored products.

Phosphine also has favourable properties regarding innocuity and the formation of no residues in treated food and animal feed products. The gas has no negative impact on the treated products and volatilizes quickly after use. Therefore, no residues are to be expected in fumigated goods. Besides, quality parameters such as germability or taste are not negatively influenced by the gas. However, according to oral reports, colour changes have arisen in different types of pulses after fumigation with metal phosphide products. This present study emonstrates the extent phosphine is may be responsible or the circumstances under cwhich certain changes in product colour may be triggered by substances emitted from the product formulation enhancers.

Materials and Methods

Five types of pulses were selected for the studies: green peas (*Pisum sativum*), broad beans (*Vicia faba*), lentils (*Lens culinaris*), white kidney beans (*Phaseolus vulgaris*) and soybeans (*Glycine max*) while the fumigants used were: MAGTOXIN Pellets (active substance Mg_3P_2, contains ammonium carbamate) at a dosage of 3.3 g PH_3 / m^3, DETIA-GAS-EX B (active substance AlP, contains no ammonium carbamate) at a dosage of 3.3 g PH_3/m^3 and pure ammonium carbamate.

The bioassays involving ammonium carbamate were carried out in a glass dessicator (diameter 320 x height 235 mm) with a perforated plate. A dish filled with ammonium carbamate was placed at the bottom of the dessicator below the perforated plate, and petri dishes containing the pulses were placed on the perforated plate. This arrangement allowed ammonia vapour escaping from the ammonium carbamate to circulate around the perforated plate unhindered. The dessicator was kept closed for 8 days. In parallel, fumigation assays using metal phosphide products were carried out in two fumigation chambers each with a volume of 0.5 m^3. The relevant amount of fumigant was introduced together with the dishes filled with the pulses. The designated period of exposure time was 8 days. The test conditions were 20°C and 65% relative humidity.

Results

After treating the various pulse seeds with ammonium carbamate (and the ammonia released from it), distinct colour changes were observed in some of the pulse varieties. Whilst white kidney beans, soybeans and green peas didn't show any apparent changes, a distinctly darker discolouration was observed in broad beans and lentils in comparison with the untreated pulses.

In the fumigation trials both products used achieved the expected maximum phosphine concentration of between 2,000 – 2,500 ppm after 48-60 hours. After the exposure time of eight days, the ammonium carbamate containing product MAGTOXIN Pellets resulted in the same colour changes which were observed when using pure ammonium carbamate. Again, broad beans and lentils were distinctly dark discoloured after the treatment whereas no changes were evident in the white kidney beans, soybeans and green peas. In contrast, the use of ammonium carbamate-free DETIA-GAS-EX B resulted in no changes in any of the pulses.

Discussion

The most important active ingredient worldwide used for controlling stored product pests is phosphine gas. Through its positive properties with regard to eco-toxicity as well as its good penetration properties and the associated excellent effectiveness against stored product pests, phosphine has become indispensable for successful stored product protection over decades. The fumigant is also known as a substance, which has no serious effects on the treated goods with regard to residues and quality.

The present trials therefore raised the question as to whether phosphine actually is responsible for apparent colour changes in pulses following their fumigation with metal phosphide products; or whether other substances in the composition of metal phosphide formulations might be held responsible for such changes.

Consideration should be given in particular to the ammonium carbamate often deployed in compressed formulations used to improve compressability and to regulate the outgassing behavior. This ammonium carbamate leads to the release of ammonia during the degassing process.

The results of comparable trials using pure ammonium carbamate as well as metal phosphide formulations with and without ammonium carbamate clearly show that to a large degree of certainty it may be assumed that the colour changes are caused by ammonia and not by phosphine.

Whereas no changes occured in the pulses following fumigation using the ammonium carbamate-free metal phosphide product 'DETIA-GAS-EX B', dark discolouration in various pulses was observed following treatment with the product containing ammonium carbamate "MAGTOXIN Pellets" as well as following treatment with pure ammonium carbamate.

RYMAN (2017) reported similar results after having treated various pulses with metal phosphides which contained or did not contain ammonium carbamate. After treatment with formulations containing ammonium carbamate on a few pulses, he likewise reported dark changes in colour whereas none of the varieties displayed changes after having been treated with the ammonium carbamate-free product DEGESCH PLATE.

It is known that especially tannic woods display discolouration in the presence of ammonia and on contact with the substance darken in colour (SELL AND KÜHNE, 1967). This circumstance is consciously utilized, for example when "smoking" oakwood, in order to modify the colour of the wood (MARQUARDT, 2005).

MARQUARD (1998) describes that pulses might also contain tannic acid and tannins. The amount can vary from species to species and from type to type and ranges from more or less no tannic acid up to 4.5% in the dry weight of the pulses.

In this respect, it can therefore be assumed that the colour changes in individual pulses are caused by the reaction of the ammonia from metal phosphide formulations containing ammonium carbamate with the tannin contained in the various pulses.

In order to avoid visual changes in the form of dark discolouration in pulses after treatment with metal phosphide formulations the use of formulations which do not contain any ammonium carbamate is recommended for such treatment.

References

MARQUARD, R. 1998: Nutritive und antinutritive Inhaltsstoffe der Leguminosen. In: Schuster W., Alkämper J., Marquard R., Stählin A., Stählin L. – Leguminosen zur Körnernutzung. Institut für Pflanzenbau und Pflanzenzüchtung I der Justus-Liebig-Universität, Gießen 1998. http://bibd.uni-giessen.de/gdoc/2000/uni/p000003/nutrtiv.htm (reviewed March 2018), 1998.

MARQUARDT, C. 2005: Prozess der Räucherung von Eiche und die wichtigsten Einflussfaktoren. Diploma thesis, Fachhochschule Rosenheim 2005.

RYMAN, D.L. 2017: Pulse fumigation with different metal phosphide products. Unpublished study report, Degesch America Inc. Weyers Cave, USA

SELL, J. AND KÜHNE, H. 1967: Verfärbungen von Eichenparkett durch Zusatzmittel für Beton und Mörtel. Schweizerische Bauzeitung, 85. Jahrgang, Heft 14, 254-259.

The Postharvest Education Foundation's Role in Reducing Postharvest Losses

Deirdre Holcroft[1], Lisa Kitinoja

[1]The Postharvest Education Foundation, PO Box 38, La Pine, Oregon 97739, USA
*Corresponding Author: D. Holcroft (postharvest@holcroft.biz)
DOI 10.5073/jka.2018.463.209

Abstract

The Postharvest Education Foundation (PEF) was founded to address postharvest losses through education and training. Postharvest expertisewas identified as a key weakness in many developing countries. The PEF provides innovative programs that motivate and empower people to reduce food losses and waste. At the heart of the PEF is a structured e-learning program that provides a practical curriculum to address the causes of postharvest losses, as well as methods to minimize these losses for horticultural crops and staple foods. E-learning is an efficient and cost-effective way to reach interested parties globally, and keeping costs low enables PEF to train and mentor a large number of candidates in developing countries. The curriculum entails several assignments and participants can conduct these assignments on a crop of their choice, making the training relevant to their situations. Most of the 154 people who have completed the program have in turn trained hundreds of farmers, traders and marketers in their own regions inhandling fresh produce, crop storage, and food processing, thereby delivering maximum impact with minimum input. In addition to its e-learning program, the PEF provides education on improved technical practices along the postharvest chain and on extension education. This training includes a wide range of topics from measuring postharvestlosses to designing demonstrations on storage, pest management, packaging and temperature management, from building and using low cost cold storage systems to calculating return on investment of changes in handling practices. The PEF also provides advice on designing postharvest training and service centers. This information is available on the organization's website. In addition, mentoring is provided through social media sites, continuing with the philosophy of providing distance education and training.

Keywords: E-learning, fresh produce handling, storage