An overview of the state-of-the-art of postharvest losses in Brazil[1]

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Introduction

Food security is gaining importance due to population increase and scarcity of natural resources. Bourne (1977) recommends three ways to achieve food security: (i) increase in arable land; (ii) increase in productivity through intensive use of technology; and (iii) increase in growing seasons per year. However, another important alternative focus on reduction of postharvest losses within operations between rural producer and consumer (Lipinski et al., 2013).

Brazil has being an important food supplier through agricultural expansion. Thus, it is important to understand the state of art of postharvest losses (PHL) to strengthen the efficiency of food distribution.

Objectives

The objective of this study is to perform a meta-analysis of the main items of postharvest losses in Brazil, involving the following indicators: products, types of losses, cause of resources, methodologies, metrics losses and year of publication.

The contribution of this study is to identify opportunities for future studies involving the theme of PHL.

Methodology

This studied was divided into three phases: (i) identification of sixty major articles published in national / international journals and conferences that evaluate issues of PHL in Brazil from 2000 and on; (ii) development of indicators for meta-analysis, according to definition of PHL categories, methodologies and metrics proposed by Caixeta-Filho (1999); and, (iii) classification of articles based on (ii) criteria.

The indicators for meta-analysis of the articles are:

- Group of agricultural products: subdivided into vegetables, grains, seeds, flowers and fruits.
- Type of loss: (i) Quantitative - direct damage to products, handling, packaging, storage and transport (usually considered as ways for spread of diseases and physiological disorders); and (ii) Qualitative - involves losses related to biological, microbiological and chemical activities (usually affects organoleptic and nutritional properties of products);
- Cause of loss: related to causes of loss such as packaging and handling, storage, transport, and physiological disorders, diseases and pests;

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- Methodology: approaches used to assess PHL, involving: survey, sampling, field and laboratory experiments, literature review, among others;
- Metrics of PHL: metrics related to the magnitude of losses such as weight loss, physical chemistry, economic, nutritional, among others.
- Year of publication;

The following databases were searched: Web of Science, Scopus and Google Scholar.

Results

The most studied groups of agricultural products are fruits (45.9%), vegetables (27.9%), grains (23%), seed (1.6%) and flower (1.6%).

Regarding the type of loss, it was found that 83.8% of the studies focused on quantitative losses and 16.2% in quality loss.

As the cause of loss, it was found that 43.2% of the studies focused on storage activity, 23% in handling and packaging activity, 17.6% in transport, and 16.2% in biological activities (physiological disorders, diseases and pests).

The methodologies employed are: experiments conducted in field and laboratory (55.7%), in-site sampling (23%), literature review (9.8%), interviews / surveys (8.2%), and review of measurement methods (3.3%).

The most used PHL metrics are: weight loss (40.6%), biological infestation (26.4%), physic-chemical (22.6%), nutritional (9.4%) and economic (0.9%).

As regards year of publication, 63.1% of the articles were published between 2000 and 2008, while 36.9% were between 2009 and 2014.

The main take-home messages are:

- During the 2000 decade, most studies of PHL were related to vegetables and fruits with focus on losses during storage with experiments using controlled atmosphere and waxes / hormones to increase the shelf life and development of appropriate packaging technology applications;
- Studies of PHL in grains can be divided into two stages. The first stage, during the 2000 decade, studies were related to qualitative and quantitative losses of grains in storage to establish appropriate procedures in the various storage operations. The second stage has recent studies, published since 2010, involving physical losses during transportation of the product, especially in road transport;
- Methodologies for assessment of losses caused by biological activities, storage and packaging were replicated on several studies, whereas for losses caused by transportation, the methodologies used were found in different studies evaluated, even with a questionnaire application dependency.

Conclusions

The objective of this study was to perform a meta-analysis of the main items of postharvest losses in Brazil, identifying opportunities for future studies.

The subject of postharvest losses follows a multidisciplinary approach, involving agricultural fields of study, agricultural engineering, economics, physiological, biology, among others.

For future studies, the following recommendations are made:

- Development of studies approach in supply chain of agricultural products to establish loss on all links;
- Recommendations from specific analysis of regional public policies to minimize PHL;
- Establishment of standardized methodologies for agricultural products / PHL assessment, especially in emerging areas of studies, mainly related to transportation - including multimodal;
- Inclusion of other types of losses, such as economic, environmental and social;
- Identification of equipment used and recommendations of technologies for minimization of PHL.

References

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