



## Improvement of nutritional quality of food crops with fertilizer: a global meta-analysis

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### Abstract

Providing the world's population with sufficient and nutritious food through sustainable food systems is a major challenge of the twenty-first century. Fertilizer use is a major driver of crop yield, but a comprehensive synthesis of the effect of fertilizer on the nutritional quality of food crops is lacking. Here we performed a comprehensive global meta-analysis using 7859 data pairs from 551 field experiment-based articles published between 1972 and 2022, assessing the contribution of fertilization with a wide set of plant nutrients to the nutritional quality of food crops (i.e., fruits, vegetables, cereals, pulses/oil crops, and sugar crops). On average, fertilizer application improved crop yield by 30.9% (CI: 28.2–33.7%) and nutritional quality (referring to all nutritionally relevant components assessed: carbohydrates, proteins, oil, vitamin C, representative mineral nutrients, and total soluble solids) by 11.9% (CI: 10.7–12.1%). The improvements were largely nutrient- and crop species dependent, with vegetables being the most responsive. Potassium, magnesium, and micronutrients played important roles in promoting crop nutritional quality, whereas the combined application of inorganic and organic source(s) had the greatest impact on quality. Desirable climatic conditions and soil properties (i.e., silt loam, soil organic matter 2.5–5.0%, and pH 4.5–8.5) supported further enhancements. Considering cross-continent responsiveness, the increase in the nutritional quality of food crops with fertilizer application was greatest in Africa. In a nutshell, our findings pave the way towards a quantitative understanding of nutrient management programs and responsible plant nutrition solutions that foster the sustainable production of nutritious and healthy food crops for human consumption.

**Keywords** Soil and environmental conditions · Soil fertility and plant nutrition · Agriculture production · Biofortification · Human health · Food security

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# Improvement Of Nutritional Quality Of Food Crops FaO Plant Production And Protection Paper

**V. Silano,H.C. Bansul,A. Bozzini**

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**Nutritional Quality of Plant Foods**, 1998      **Poultry Science** Milad Manafi, 2017-02-15 When it comes to life science and specially by considering animal origin protein one of the main topics to gain importance with respect to human nutrition and health is poultry science. This book presents an introductory overview to the different fields/branches of poultry science with four main divisions: different feed resources for poultry, biofilms of salmonella and campylobacter in the poultry industry, prevention of different contaminants in modern poultry farms, and mycotoxins in poultry feed. This book will be beneficial for the graduate students, teachers, researchers, farmers, and other professionals who are interested to fortify and expand their knowledge about chicken products in fields of poultry science, biotechnology, plant science, and agriculture.

**Seed Proteins** W. Gottschalk, H.P. Müller, 2012-12-06 Investigations on seed proteins have been intensively carried out during the past two decades. This is valid with regard to both their chemical composition as well as their nutritive value. The development of new biochemical and physical methods has resulted in obtaining deep insights into the structures of seed proteins and their mutual interactions. Intensive exchange of information between the scientists participating in national and international research programmes has given strong impulses for intensifying the research in this field. For the quantitative and qualitative investigations of seed proteins not only some model plants were used on the contrary they were carried out on a large number of different crops important for different regions of the earth. In this way a level of knowledge has been reached which could not be expected in this diversity within such a short period. This holds not only true for biochemical but also for physiological characters of the species of the limiting amino acids studied. With regard to nutritional aspects the problem was of special interest but also seed proteins acting as antinutritional factors were analysed in detail. Based on the knowledge of seed protein structures it was possible to perform investigations on the genetic basis of their synthesis. This was done under two different aspects. The basic knowledge on the genes involved should be widened; moreover it should be tried to improve the seed proteins quantitatively and qualitatively under the influence of mutant genes.

**Polyploidy and Hybridization for Crop Improvement** Annaliese S. Mason, 2017-11-22 Many of our current agricultural crops are natural or agricultural hybrids between two or more species or polyploids containing more than one genome or set of chromosomes. These include potato, oats, cotton, oilseed rape, wheat, strawberries, kiwifruit, banana, seedless watermelon, triticale, and many others. Polyploidy and hybridization can also be used for crop improvement, for example to introgress disease resistance from wild species into crops to produce seedless fruits for human consumption or even to create entirely new crop types. Some crop genera have hundreds of years of interspecific hybridization and ploidy manipulation behind them, while in other genera

use of these evolutionary processes for crop improvement is still at the theoretical stage This book brings together stories and examples by expert researchers and breeders working in diverse crop genera and details how polyploidy and hybridization processes have shaped our current crops how these processes have been utilized for crop improvement in the past and how polyploidy and interspecific hybridization can be used for crop improvement in the future **Plant Breeding**

**Reviews, Volume 36** Jules Janick,2012-09-17 Plant Breeding Reviews presents state of the art reviews on plant genetics and the breeding of all types of crops by both traditional means and molecular methods Many of the crops widely grown today stem from a very narrow genetic base understanding and preserving crop genetic resources is vital to the security of food systems worldwide The emphasis of the series is on methodology a fundamental understanding of crop genetics and applications to major crops It is a serial title that appears in the form of one or two volumes per year **Ghana Journal of Development Studies** ,2006 **Improvement of Nutritional Quality of Food Crops a State of the Art Report FAO Plant Producton and Protection Paper** V. Silano,H.C. Bansul,A. Bozzini,1981 **Nutritional Quality of Cereal Grains**

Robert August Olson,K. J. Frey,1987 This monograph looks at the nutritional value of cereal grains reviews the relationship of grain yield and nutritional quality studies the modification of nutritional quality by environment and production practices and examines cereal vegetation as a source of forage Rice wheat rye triticale corn barley sorghum pearl millet and oat are covered **Improvement of Grain Legume Production Using Induced Mutations** Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development,1988 **Abstracts on Tropical**

**Agriculture** ,1982-05 **Pesticide Residues in Food** ,1981 **Report on the Second FAO/SIDA Seminar on Field Food Crops in Africa and the Near East** ,1977 **Developing Sustainable and Health-Promoting Cereals and**

**Pseudocereals** Marianna Rakszegi,Maria Papageorgiou,João Miguel Rocha,2023-03-27 Developing Sustainable and Health Promoting Cereals and Pseudocereals Conventional and Molecular Breeding reviews the most recent developments in the fields of cereal and pseudocereal breeding with particular emphasis on the latest biotechnological techniques likely to lead to breakthrough changes in plant breeding The book provides comprehensive information on the use of genetic resources or pre breeding activities to improve health related properties of cereals and pseudocereals The text also explores targeted field management practices and the latest in biotechnological methodologies and offers a cohesive overview necessary for understanding the potential impacts and benefits of improved production of cereals and pseudocereals with high nutritional value Includes coverage of cereals and pseudocereals in a single comprehensive volume Focuses on sustainable circular economy including assurance of food safety quality and health benefits Examines breeding to attain robust cereal and pseudocereals with higher nutritional value and adapted to specific regions climate change and global warming **The Journal of Agriculture of the University of Puerto Rico** ,1934 **Scientific and Technical Books and Serials in Print** ,1984 **Plant genetic resources** Dr M. Ehsan Dulloo,2021-03-23 Covers both in situ and ex situ strategies for

conserving and exploiting plant genetic diversity Particularly strong coverage of in situ and on farm techniques including collection and management of wild plant populations community based conservation strategies participatory plant breeding programmes and seed systems to ensure farmer access to improved varieties Covers improvements in characterising evaluating and safe exchange of germplasm to accelerate crop breeding programmes

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