

Nanofertilizer in agriculture: a patent overview

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INTRODUCTION & AIM

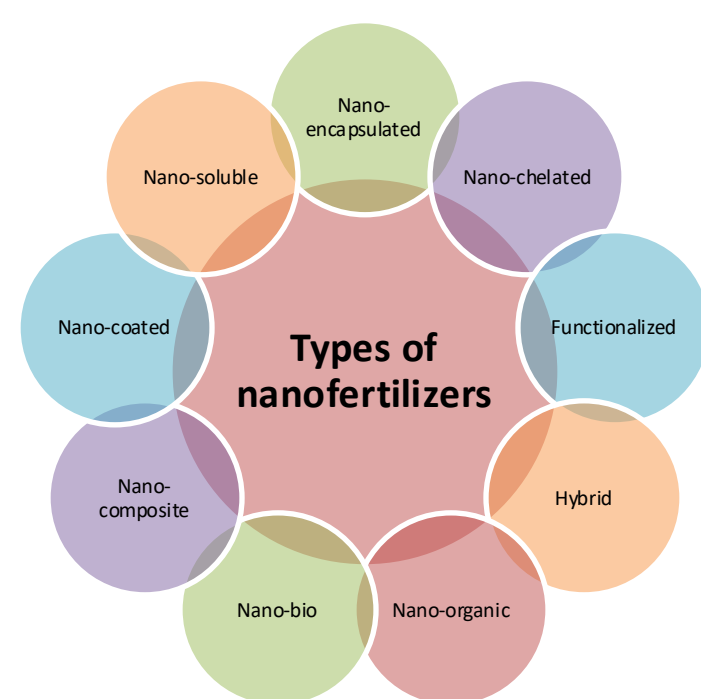
The application of nano-fertilizers (NFs) represents a nascent area of research within the field of agriculture.

These are materials in the size range of 1-100 nm that facilitate the provision of nutrients to plants, enhancing crop growth and productivity.

Nanofertilizers (NFs) are composed of nutrients and may serve as carriers for nutrients, releasing them in low amounts and in a slow and sustainable manner.

Nanofertilizers are classified based on their arrangement, material and delivery methods [1].

This is a graphical representation of various types of fertilizers.



The utilization of NFs can mitigate environmental contamination, as up to 50-80% of applied traditional fertilizers are lost.

The essential nutrients required for optimal crop growth are **nitrogen**, **phosphorus**, and **potassium**. [2]

The objective of this paper is to present a comprehensive overview of the patent activity pertaining to nanofertilizers.

METHOD

In the course of this investigation, data were retrieved from a number of patent databases, including Patentscope, Espacenet, Orbit Intelligence, and The Lens.

A search was conducted using precise keywords in the Title/Abstract/Claims search fields. In addition, the full text was in conjunction with keywords and classification symbols (B82B, B82Y, A01 and C05).

The three main IPC classification symbols retrieved with Espacenet are summarized in the following table:

IPC Code	No. of results	Definition
C05G3	663	Mixtures of one or more fertilizers with additives not having a specially fertilizing activity
C05G5	223	Fertilizers characterized by their form
A01C21	153	Methods of fertilizing

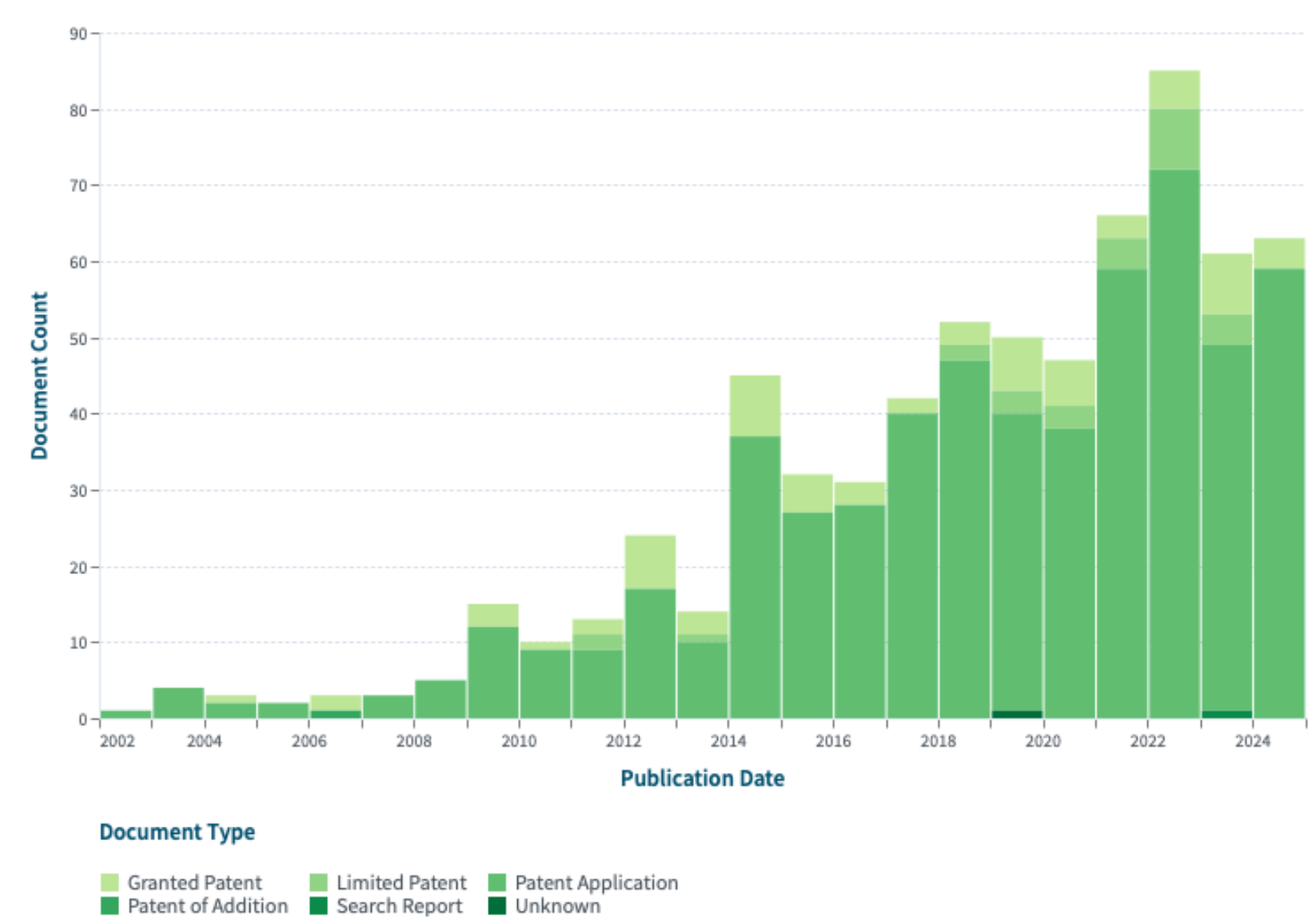
The final search queries employed for each database are as follows:

Database	Search query
Espacenet	(ctxt all "nano_fertili#er" OR (ftxt any "fertili#er" AND (cl any "B82B" OR cl any "B82Y"))) OR ftxt=("nano" prox/distance<3 "fertili#er")) AND (cl all "A01" OR cl all "C05")
Patentscope	EN_ALLTXT:(nano NEAR fertilizer) OR (EN_ALLTXT:(fertilizer) AND IC:(B82B) AND IC:(B82Y))
The Lens	("nano fertilizer" ~5) OR ((fertilizer) AND ((classification_ipc: B82B*) OR (classification_ipc: B82Y*)))

RESULTS & DISCUSSION

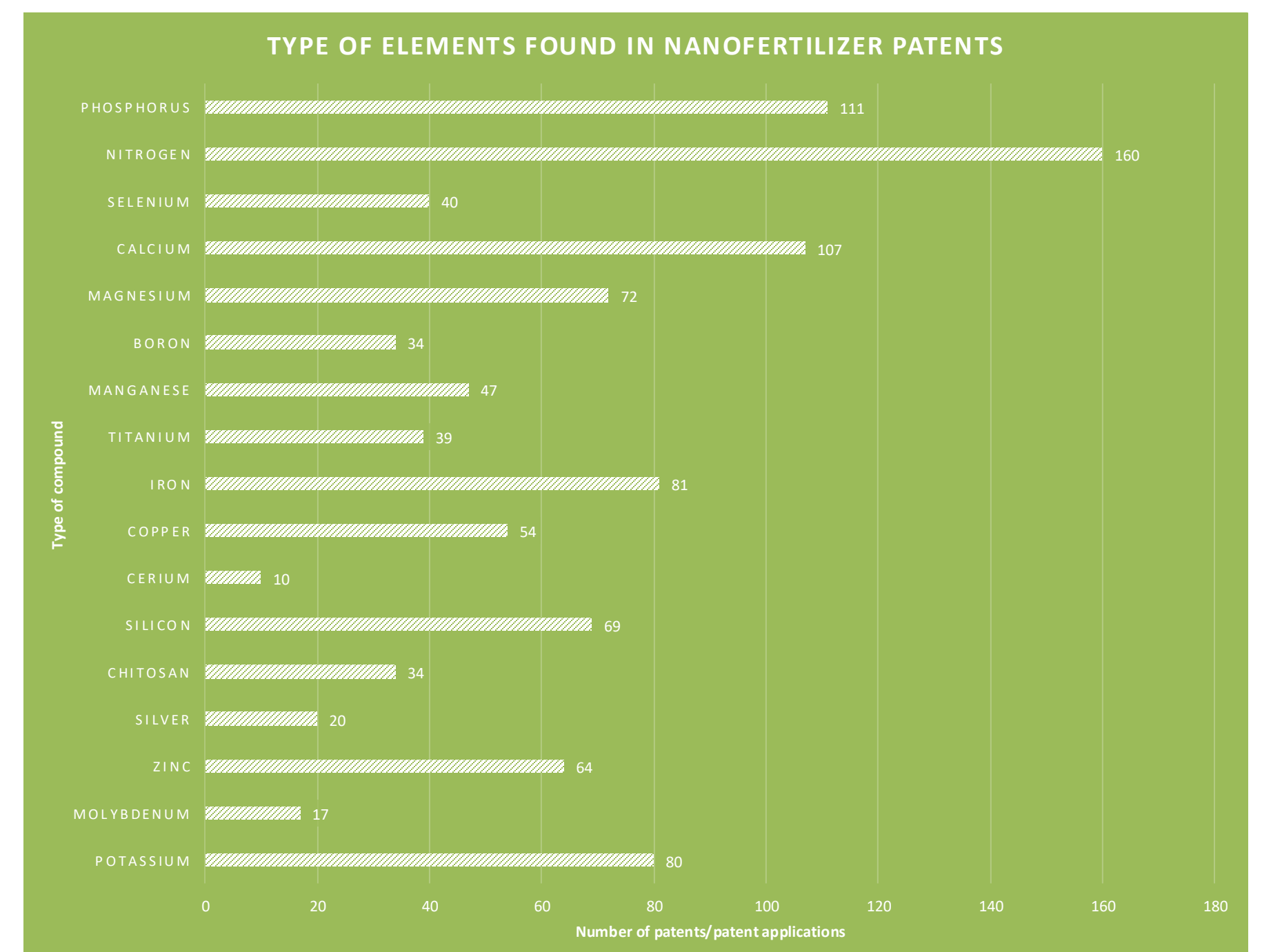
The majority of inventions in this field were filed in China, with the United States and India representing the next most prolific sources.

The number of filings has exhibited a notable increase over the past decade, suggesting a growing trend.



Source: The Lens

With regard to the elements present in nanofertilizers, the most frequently claimed in patent applications (as retrieved on Orbit) are **nitrogen**, **phosphorus**, and **calcium**.



CONCLUSION

The findings of this study corroborate the importance of academic and industrial research on nanofertilizers.

China has been identified as the foremost nation in this technical domain.

REFERENCES

- [1] Savarana kumari, P. et al. Biofortification of crops with nutrients by the application of nanofertilizers for effective agriculture. *Plant Physiology and Biochemistry* **2024**, *212*, 108772
- [2] Singh, A. et al. Nanotechnology Interventions for Sustainable Plant Nutrition and Biosensing. *Journal of Soil Science and Plant Nutrition* **2024**, *24*, 1775 – 1798.