**Reviewer Comment**

The manuscript entitled : Inorganic Metaloxide Nanoparticles Seed Invigoration for Extended Storability of Sunflower (Helianthus annus) under Ambient Environment

Points for improvement of the manuscript:

* Author has the merit of attempting seed storage blended with NP.
* But, NP need not be the case always even for seed storage. If the treated seeds happened to be eaten by rodents, birds mistakenly, NP might cause severe environmental choke. It has to be used cautiously as and when it really required.
* In the title author may check the correct spelling of the botanical name (Helianthus annuus)

**In the abstract, the author pointed out that “**The results demonstrated that ZnONPs seed invigoration at 1000 mg kg-1 excelled over the other metal oxides in maintaining the seed storability for six months of storage registering 5 percent increase in germination over control (80% germination and seedling vigor of 2362)”

* But, s**unflower seeds** remain **viable** for 12 months when stored in a dry cold room, refrigerator or freezer, irrespective of the type of packaging used. In this case what is the advantage of treating sunflower with ZnONPs? That too the author has studied only for the period of six months.

In the INTRODUCTION

Sunflower (Helianthus annus) is one of the vital oilseed crop being cultivated in an area of 26 million hectares with the production of 45 million metric tonnes/annum in the world. Similarly in India, sunflower occupies 1.48 million hectares with 200 metric tonnes of production, In Tamil Nadu, it was 10 metric tonnes production.....

* This section needs supporting Reference and Source of Information.

In the sub section: i)Metal oxides nano-particles seed invigoration

Freshly harvested seeds were dried to a moisture content of 6% by sun-drying and graded by specific gravity separator.

* How the author attained 6 % moisture uniformity by mere sun drying? How many hours?

After grading, seeds were dry dressed with ZnO,TiO2, CuO @ 1000,750, and 1250 mg kg-1 , respectively .....

* Why there was a variation in the concentration of ZnO,TiO2, CuO? This might need more explanation

Under the subhead : ii) Nano-particles seed invigoration (dry dressing)

The author stated that.....Then treated seeds were stored under ambient storage condition with (25±3 ºC) temperature and 95% RH.

* Relative humidity is the ratio of the partial pressure of water vapor to the equilibrium vapor pressure of water at a given temperature. Relative humidity depends on temperature and the pressure of the system of interest. The same amount of water vapor results in higher relative humidity in cool air than warm air. If the temperature is 25 degrees C and a cubic meter of air contains 22 grams of water, then the relative humidity is 100 percent. If it contains 11 grams of water, the relative humidity is 50 percent. If it contains zero grams of water, relative humidity is zero percent. My advice, the authors may check the ambient environment as Temperature and RH of the room may play a vital role in sunflower seed storage.

In the RESULTS AND DISCUSSION

The author has provided .....Significance difference observed among NPs seed treatments. Seeds invigorated with ZnO at 1000 mg kg-1 of seeds recorded higher germination percentage (85%).....

* Being a hybrid (COH 3), what is the normal germination percentage of COH3?
* What is the idea in testing EC of treated water?

Similarly, the ZnO NPs treated seeds registered low electrical conductivity of seed leachate (1.003) at six months of ageing while it was higher in untreated seeds (1.175)

* How a untreated seeds leachate project more EC than the treated one? It is so surprising... What is the source for salt?

Again the author stated ... The seeds treated with metal-oxide NPs have outperformed in recording dehydrogenase and antioxidant enzyme activity over a period of six months storage.

* How MONP improves enzyme activity during storage?
* The loss of viability of **sunflower seeds** (that present high content of oil) is associate to the decrease of the **activity** of the **enzyme** superoxide dismutase, due to the fact that the **seed** aging stimulates peroxidation of lipids and the reduction of the **activity** of peroxide removal **enzymes.....**

**The author may Refer the following paper**

[Journal of Seed Science](http://www.scielo.br/scielo.php?script=sci_serial&pid=2317-1537&lng=en&nrm=iso)

*Print version* ISSN 2317-1537

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<https://doi.org/10.1590/S2317-15372013000200015>

**Deterioration of sunflower seeds during storage**

**In the** CONCLUSION

Finally it concluded that inorganic metal-oxide nano-particles, particularly Zinc oxide @ 1000 mg kg-1 excelled other NPS and performed better over control.

* The authors may take an attempt to study different concentration of ZONP, and test the viability by simple Water test: Take your **seeds** and put them in a container of water. Let them sit for about 15 minutes. Then **if** the **seeds** sink, they are still **viable**; **if** they float, they most likely will not sprout. This is very important as for as seed storage in concern. The author may check the storabiloity period for atleast 12 months by assessing the oil content and germination percentage will add value and meaning to the manuscript.

**I reject the manuscript, as it lacks scientific interpretation and systematic research.**