EFFECT OF VERMICOMPOSTING ON THE PRESENCE OF HELMINTH OVA (*Necator americanus, Trichuris trichiura*, *Ascaris lumbricoides)* IN HUMAN FAECES

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In the Philippines

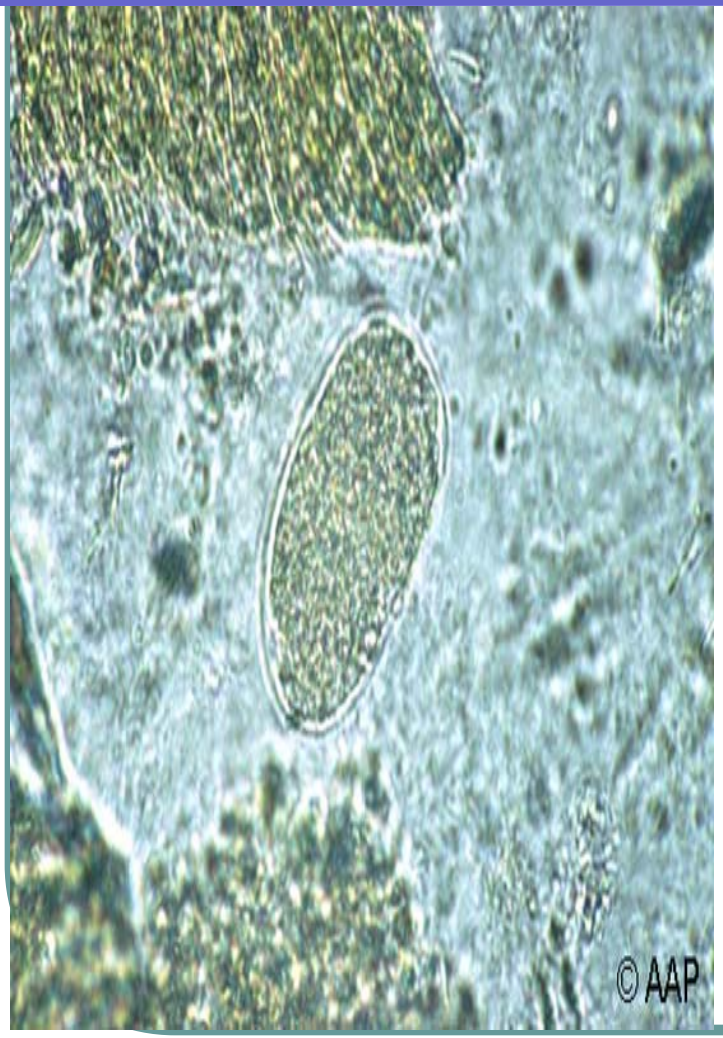
- More than 90 % of all sewage goes untreated into surface waters such as rivers and the sea
- Many local communities are used to disposing their faeces in open fields

Recent survey show that 67 % of all elementary school children suffer from intestinal parasitism

Rationale

- Several urine-diverting dehydration toilets have been established in allotment gardens of Cagayan de Oro City.
- Urine is presently re-used for crop production.
- Faeces, however, is not re-used concerning its safety as regards to the presence of helminth ova.

Hookworm ova *(Necator americanus)*

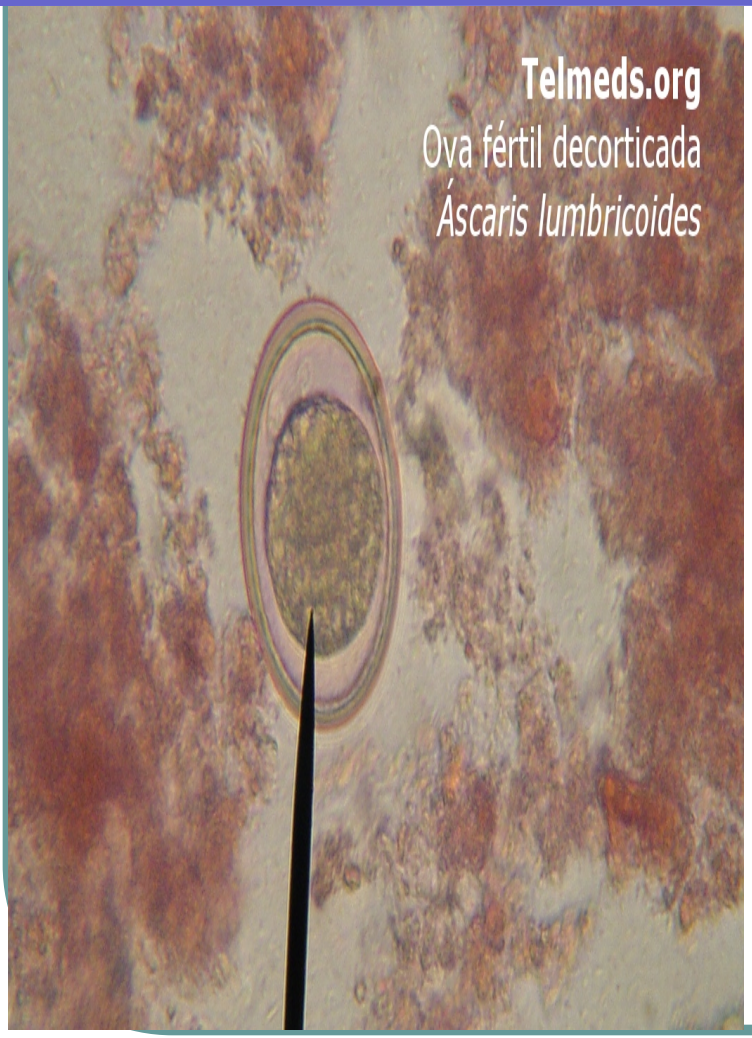


- 740 million people infected
- The adult worms release eggs into the intestinal lumen
- Once outside the host, they can hatch within 24 to 48 hours.
- Hookworm can cause vomiting, cramps, nausea, pneumonia, eosinophilia and bloody diarrhea

Whipworm ova (*Trichuris trichiura*)

- High incidence in tropics and subtropics
- Ova are extremely resistant in the environment.
- Takes up residence in the large intestine.
- After 10-14 days in soil, eggs become infective.
- Causes dysentery, loss of muscle tone and rectal prolapse that may prove fatal in children.

Roundworm ova *(A.lumbricoides)*



- Largest nematode parasitizing man
- Prevalent in the tropics
- Ova can survive in the environment for prolonged periods (10 years) and prefer warm, shady, moist conditions
- Ova are resistant to usual methods of chemical water purification
- It occludes the gallbladder, causes cough, fever, skin rash and eosinophilia

Biosolid Utilization

- Environmental Protection Agency of the United States (USEPA) has set several guidelines in the utilization of biosolids to ensure its safe use as fertilizer.
- USEPA guideline for viable helminth ova in biosolids is less than 1 ova per 4 grams of total solids (dry-weight basis).
- Pathogen reduction can be achieved by thermally treating biosolids (incineration) or treating it through non-thermal processes such as composting and vermicomposting.

Earthworms and pathogens

- A study conducted in the US used vermicomposting to process biosolids inoculated with four human-pathogen indicators, fecal coliforms, *Salmonella* spp., enteric virsuses and helminth ova.
- There were considerable reductions in the pathogenic organisms seeded with the earthworms
- Added advantages of vermicompost reused in agriculture include increased soil porosity, improved drainage and soil fertility.

Vermicomposting

- The technology whereby earthworms are seeded in the compost to aide in the digestion of wastes.
- *Eisenia fetida* was used because of its qualities of having the ability to survive on different wastes, voracious feeding, fast growth rate and high reproductive potential.

Methodology

- Randomized Complete Block Design

  (2 factorial with 4 replications)

  - Factor 1: Dried human faeces collected from two UDD toilets
  - Factor 2: Vermicomposting

Preparation of Media

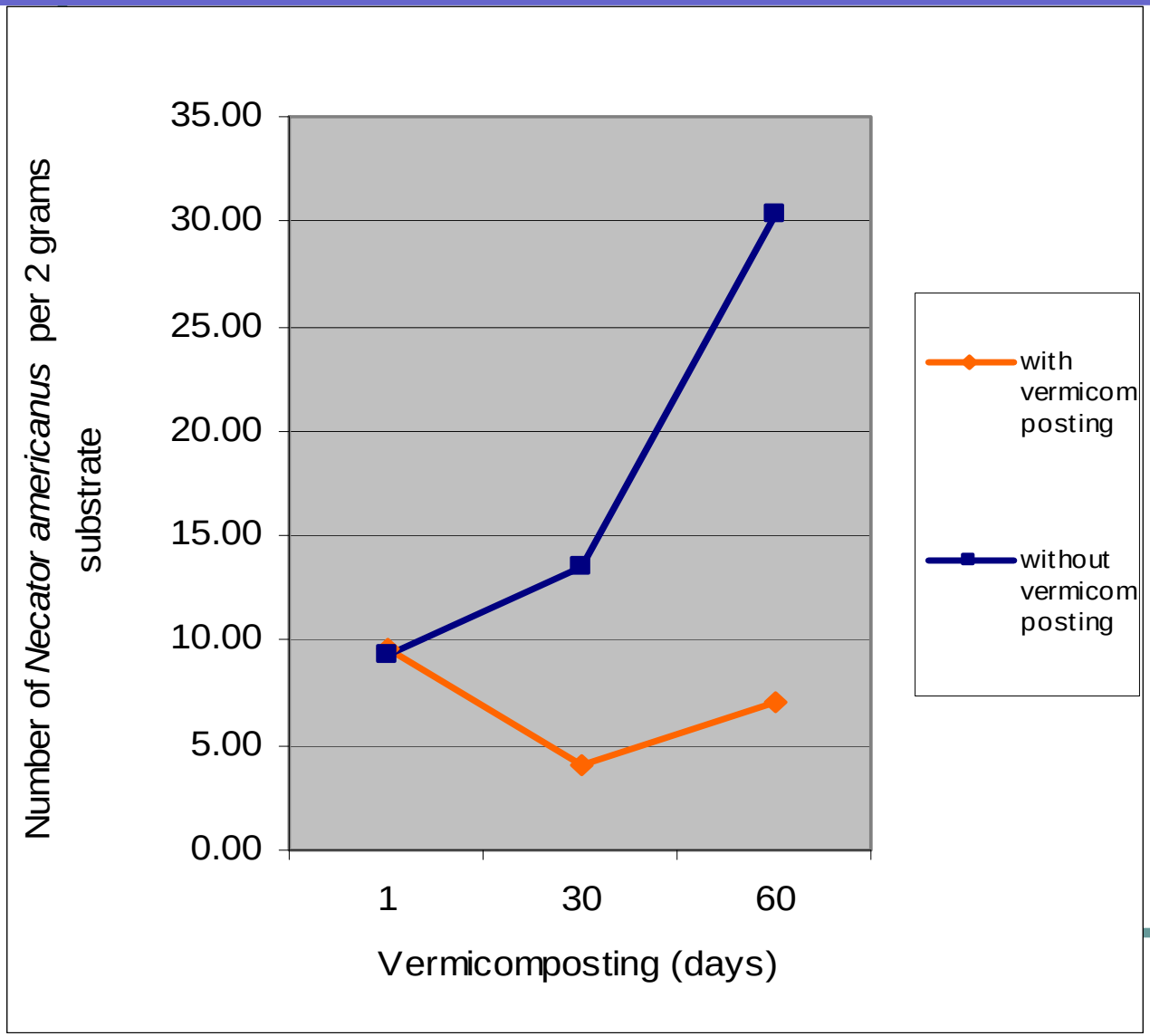
- As a substrate a 3:1:1 mixture of cow manure, shredded cornstalks and human faeces was used
- 48 kg of cow manure was mixed properly with 16 kg of shredded corn stalks (= 64 kg of basic substrate)
- 32 kg was mixed with 8 kg of human faeces from Manresa while the other 32 kg media was mixed with 8 kilos of human waste in Gusa.
- The 40 kg per location were divided into 8 boxes with 5 kg each (representing the 4 replication for the treatments with and without vermicomposting)
- Both the cow manure and the human faeces were positively tested for the presence of ova of hookworm (*Necator americanus),* whipworm *(Trichuris trichiura)* and roundworm *(Ascaris lumbricoides)* prior to the start of the experiment.

Sampling & Data Collection

- A total of 1.33 kg of Eisenia fetida was added to 4 boxes each for the locations Gusa and Manresa (167 g per box).
- The boxes were then arranged in a randomized complete block design
- 10 samples were gathered from each box on day 1 (before seeding of earthworms) as well as after 30 and 60 days
- 4 g per box were analyzed in the laboratory of Polymedic Hospital by a certified lab technician.

Samples Collected

Result Hookworm (Mean)



<u>With vermicomposting</u>

Day1 = 9.69

Day30 = 4.06

Day60 = 7.13

<u>Without vermicompsting</u>

Day1 = 9.38

Day30 = 13.5

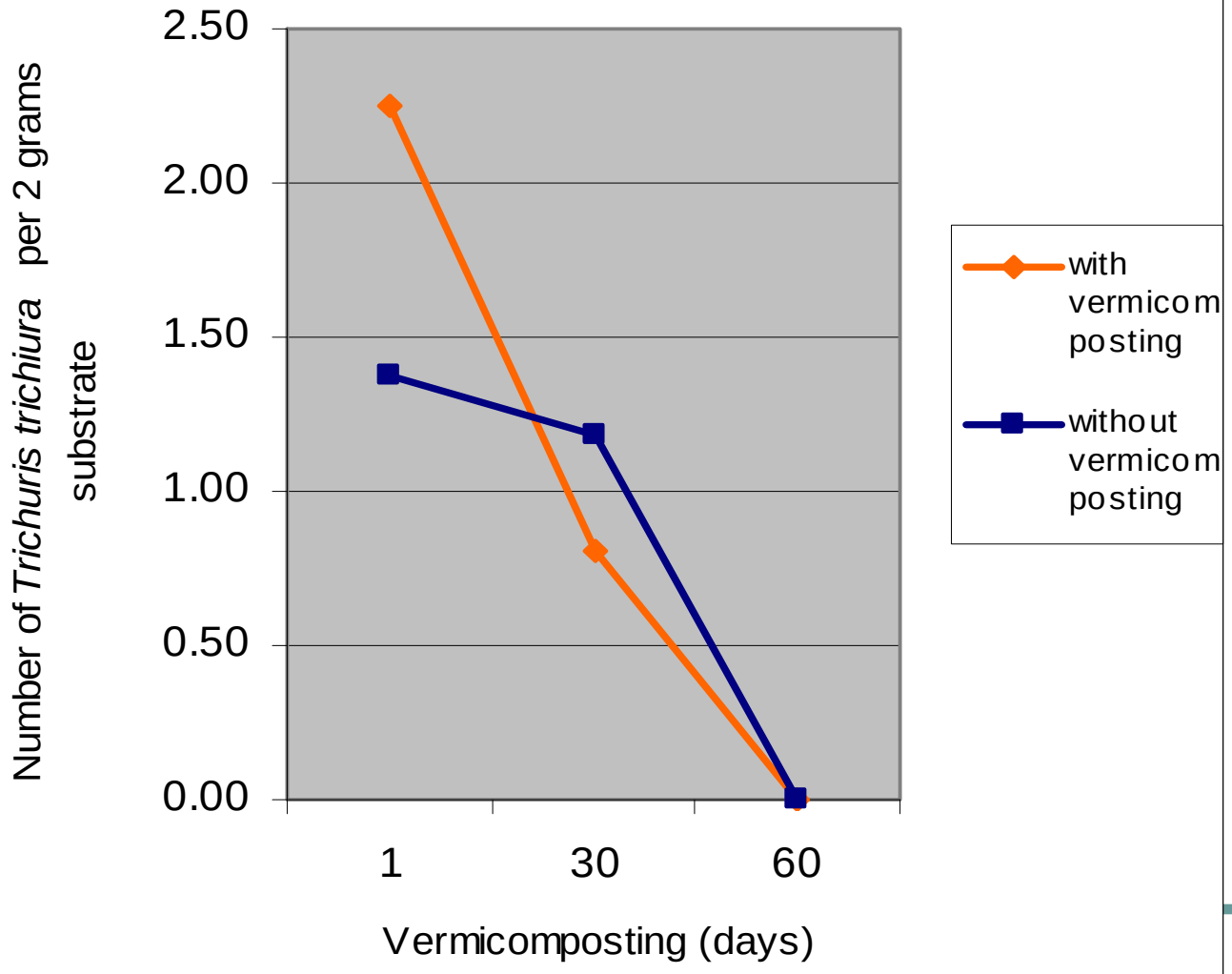
Day60 = 30.31

Summary of Means: Hookworm Ova (*Necator americanus*) after Day 60

Location:		
Gusa	19.13	a
Manresa	18.31	a*
Vermicomposting:		
Without	30.31	a
With	7.13	b

*means with the same letters are not statistically different (DMRT)

Result **Whipworm** (Mean)



<u>With vermicomposting</u>

Day1 = 2.25

Day30 = 0.81

Day60 = 0.00

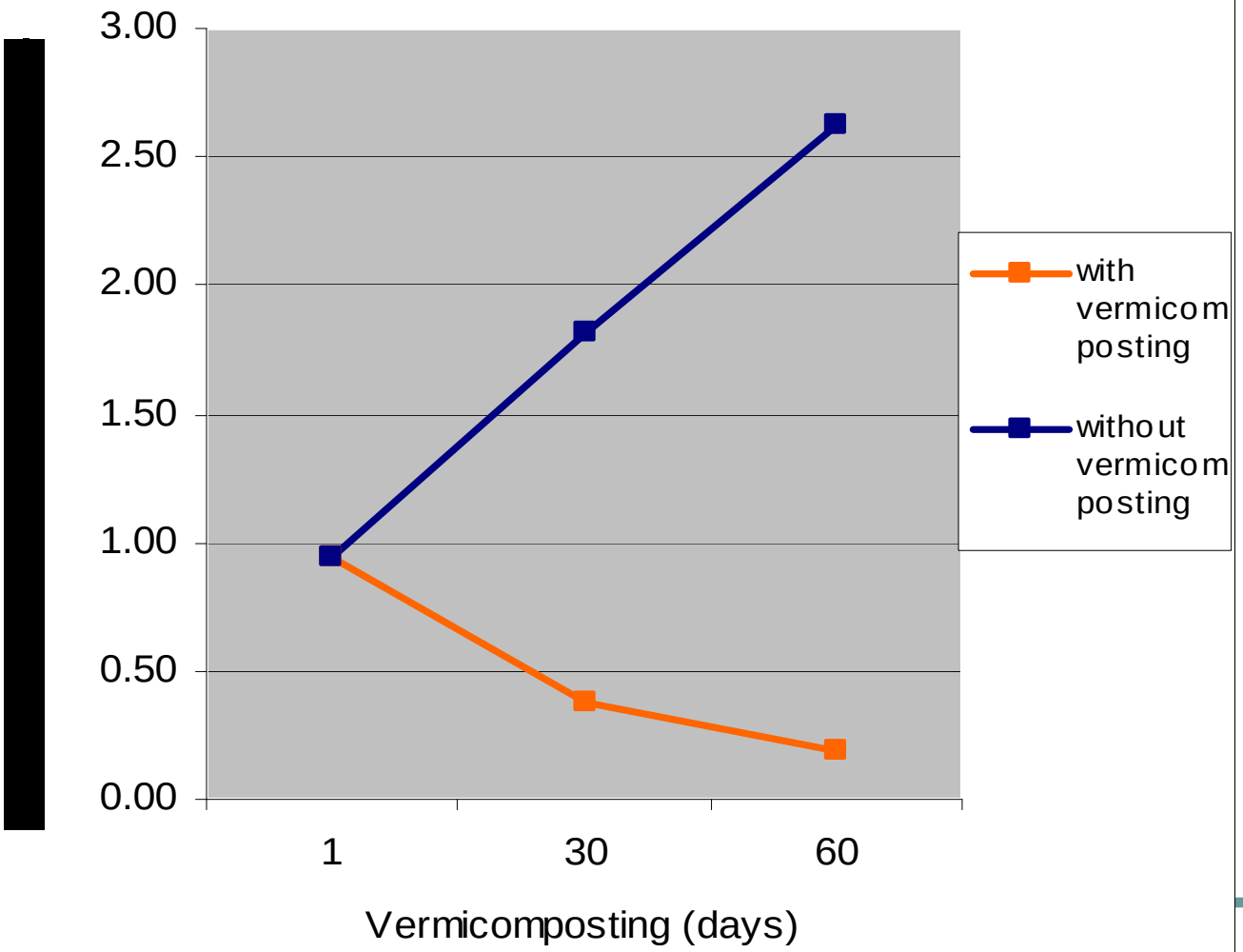
<u>Without vermicompsting</u>

Day1 = 1.38

Day30 = 1.19

Day60 = 0.00

Result Ascaris (Mean)



With vermicomposting

Day1 = 0.94

Day30 = 0.38

Day60 = 0.19

Without vermicompsting

Day1 = 0.94

Day30 = 1.81

Day60 = 2.63

Summary of Means: Roundworm Ova (*A. lumbricoides*) after 60 days

Location:

Gusa	2.19	a
Manresa	0.63	b

Vermicomposting:

Without	2.63	a
With	0.19	b

*means with the same letters are not statistically different (DMRT)

Conclusion

- After 60 days,
  - Vermicomposting significantly reduced the number of Ascaris ova below the threshold level of USEPA.
  - Whipworm ova were fully eliminated regardless of treatment.
  - Number of hookworm ova were highly significantly less in the vermicomposting treatments, however, above the threshold level of USEPA.

Recommendation

- Further researches on:
  - Longer- period exposure
  - Higher density of earthworms.
  - Effect of vermicomposting on other fecal pathogens.
  - Effect of vermicast on growth of different crops.

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DENNIS