

## Biotron seed germination study test protocol

*Objective: To establish benefits in term of better bio-availability for seed germination. The speed of germination and shoot and root length is directly correlated to the bioavailability of water in dry seeds*

*Materials:*

- 1. Micro lab Petri plates** 6 Nos -3 sets for tap water samples and 3 sets for Biotron water
- 2. Surgical cotton:** equal weight for both samples. This is for the absorption of water and to maintain humidity.
- 3. Seeds:** Select healthy seeds equal size and **weight** .

*Do not take very dry seeds from market*

- 4. Sample water:** Tap water and biotron water from Dr. Aquaguard Magna ro+uv

*Use always fresh water both from tap and Magna ( Do not use water stored in bottle for a long time for watering the seeds due possible depletion of oxygen).Maintain the pH of the water samples 7-8 for better result*

**Environmental condition :** Ideally 25 to 30 degree Celsius ambient temperature and relative humidity > 60% .Do not run the experiment in high ambient temperature .This may delay the germination of seeds .

Test procedure

- **Seed preparation:** Wash the seeds with sterilized to remove fungus spores and clean with sterile tissue paper.
- Note the weight of the seeds
- Soak the seed for 3 hrs (use respective water samples for soaking)
- Arrange 3 sets of petri plates for each water sample ( 3 for tap water and 3 for Dr. AG Magna RO+UV (Biotron) water. Clean the petri plates with distilled water and label clearly.
- Put 3 gms of clean cotton in to each petri plates and make a uniform layer.
- Add 40 ml tap water to the first 3 set of petri plates & 40 ml biotron water to the other 3 set of petri plates to soak the cotton. Drain the excess water from petri plates (do not press the cotton layer).
- Take the soaked seeds and place it on wet cotton bed in each petri plate . 10 nos in each petri plate. Give space between the seeds
- Keep the petri plates in a clean, sterile environment in your lab at room temperature
- Sprinkle water if required, with respective water sample (equal quantity in each plate ).
- Measure the environmental parameters like humidity, temperature and keep the petri plates in a clean, sterile environment in your lab at room temperature and quantity of water used.

**Observation:**

*Note the weight of the seed after 1 hr soaking, 2 hrs soaking and 3 hrs soaking to know the water absorption rate .Calculate the increase in weight.*

*Observe the record the no. of seeds germinated in each plate after 18 hrs, 24 hrs, 36 hrs, 48 hrs, 60 hrs & 72 hrs. Take photographs of the seeds morphology during each observation.*

*Also record the environmental parameters*

*Study report:*

*Delhi Lab : Germination of wheat and shoot/root length*

### Biotron Validation Study

Lab	Name of the Seed	Water source	18 hrs	24 hrs	36 hrs	48 hrs	60 hrs	72 hrs	
Bhubaneswar	Green Peas	Tap Water	7%	20%	70%	90%	100%		
		Biotron water	17%	40%	83%	100%	100%		
	Green Gram	Tap Water	60%	67%	100%	100%	100%		
		Biotron water	87%	90%	100%	100%	100%		
	Chickpea	Tap Water	37%	70%	90%	90%	100%		
		Biotron water	60%	83%	90%	93%	100%		
Mumbai Lab	Green Lentils	Tap Water	Nil	Nil	Nil	Nil			
		Biotron water	7%	7%	7%	7%			
Kochi Lab	Green Gram	Tap Water	90%	90%					
		Biotron water	100%	100%					
Chandigarh Lab	Green Gram	Tap Water	7%	7%	13%				
		Biotron water	17%	27%	33%				
	Wheat	Tap Water	7%						
		Biotron water	23%						
Delhi	Green Gram	Tap Water	Nil	Nil	3%	3%	83%		
		Biotron water	Nil	Nil	17%	17%	83%		
	<b>Study conducted in Soil Medium</b>								
	Brown Gram	Tap Water	65%	70%	90%	90%	90%		
		Biotron water	65%	90%	90%	90%	90%		
	Wheat	Tap Water	77%						
		Biotron water	83%						

### Root & Shoot Length study

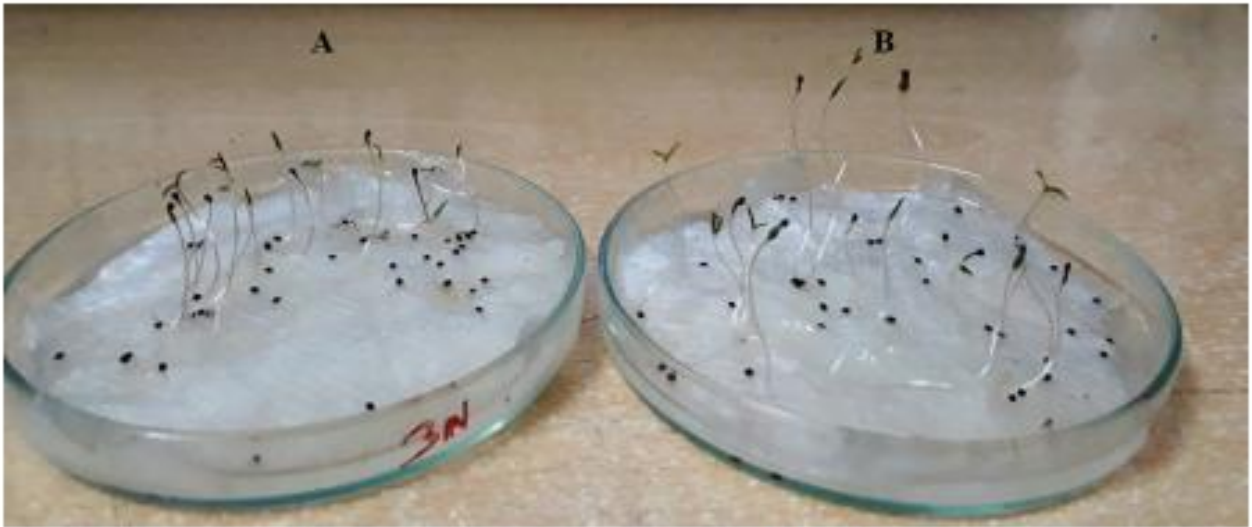
Delhi Lab

Shoot and Root length of 5 brown gram seeds which grown maximum after 60 hrs				
After 60 hrs.	Normal Water		BIOTRON WATER	
	Shoot Length (cm)	Root Length (cm)	Shoot Length (cm)	Root Length (cm)
Seed-1	3.8	6	5.9	7.5
Seed-2	4.2	3.3	3.2	6.3
Seed-3	2.2	2.8	8.5	8.2
Seed-4	3.7	4.5	3.6	6.3
Seed-5	2.1	3.6	3	5.5
<b>AVERAGE</b>	<b>3.2</b>	<b>4.04</b>	<b>4.84</b>	<b>6.76</b>

**Hyderabad study :** *Amaranthaceae* family seeds were exposed with magnetized water collected from Dr.Aquaguard Magna RO+UV domestic water purifier which has incorporated with the biotron (Magnetron) technology

**Fig.3b.**

*Amaranthus tricolor* seed germination at 96 hr



**A- Seeds treated with normal tap water**

**B- Seeds treated with magnetized water**

**Table -1** Root length, stem and leaves were measured in terms of mm and presented in table.

Sl.No.	Name of the plant	Name of the plant part	Length of normal tap water treated (mm)	Length of magnetized water treated (mm)
1.	<i>Amaranthus gengeticus</i>	Root	17 ± 01	20 ± 02
		Shoot	24 ± 02	33 ± 02
		Leaf	03 ± 01	04 ± 01
2.	<i>Amaranthus tricolor</i>	Root	15 ± 02	17 ± 01
		Shoot	27 ± 02	27 ± 01
		Leaf	04 ± 01	05 ± 02
3.	<i>Amaranthus blitum</i>	Root	03 ± 01	23 ± 01
		Shoot	08 ± 02	29 ± 01

**Osmosis study:** *Amaranthus tricolor*, *Amaranthus gengeticus*, *Amaranthus blitum* were immersed in magnetized water and in normal tap water at different time intervals . The results were tabulated in table.2. From the results it was clear evident that the absorption of water molecules into seeds are gradually increased in both the treatment but in case of magnetized treated water it was much better.

Table .2

Osmosis study on different seeds treated with normal water and magnetized water – (measured in µg)									
(50 seeds)									
Sl.No.	Name of the	Treatment	Wt of dry	Wt 1hr	%Wt Increase	Wt 3hr	%Wt increase	Wt 6 hr	%Wt increase
1	Amaranthus gengeticus	Normal tap water	60	70	16.6	90	50	110	83.3
		Magnetized water	50	70	40	90	80	130	160
2	Amaranthus tricolor	Normal tap water	30	40	33.3	40	33.3	50	66.6
		Magnetized water	40	60	50	70	75	80	100
3	Amaranthus blitum	Normal tap water	50	80	60	110	120	130	160
		Magnetized water	50	100	200	130	160	140	180
Speed of water absorption study									

### Bhubaneswar Study

Observation - Seed-2(VIGNA)								
Time Duration	Normal Water				Biotron Treated Water			
	Plate-1	Plate-2	Plate-3	Average	Plate-1	Plate-2	Plate-3	Average
After 18 hours	5	5	8	6	9	8	9	8.7
After 24 hours	6	5	9	6.7	10	8	9	9
After 36 hours	10	10	10	10	10	10	10	10
After 48 hours	10	10	10	10	10	10	10	10
After 60 hours	10	10	10	10	10	10	10	10
After 72 hours	10	10	10	10	10	10	10	10
Shoot and Root length of 5 VIGNA MUNGO seeds which grown maximum after 108 hrs								
After 108 hrs.	Normal Water			BIOTRON WATER				
	Shoot Length (mm)	Root Length (mm)	Leaves (mm)	Shoot Length (mm)	Root Lenth (mm)	Leaves (mm)		
Seed-1	190.00	100.00	20.00	212.00	120.00	22.00		
Seed-2	180.00	90.00	18.00	200.00	100.00	22.00		
Seed-3	200.00	80.00	15.00	220.00	100.00	20.00		
Seed-4	210.00	90.00	20.00	225.00	110.00	20.00		
Seed-5	200.00	85.00	15.00	210.00	100.00	22.00		



After 48 hours									
After 60 hours									
After 72 hours									

