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To determine the potential of agrohomeoeopathy by using calcarea phosphorica 200c by seed priming technique and analyzing the germination rate and growth rate of *Vigna unguiculata* plant (cow pea) plant

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Abstract
This study was undertaken to know the effectiveness of calcarea phos 200C on Agrohomoeopathy, a single blinded study that shows experimental group had good yield when compared to control group.
Background: This article gives an insight to common man who is interested in farming or agriculture, to get accustomed with new technique and effectiveness of homoeopathic medicines in Agrohomoeopathy, how we can increase germination rate and growth rate of various plants cost effectively, so that we can take various common problems that arises during cultivation of such plants.
Methods: Various old literatures throws light upon Agrohomoeopathy, and its role on homoeopathic medicine upon different plants. New techniques like Seed Priming is highlighted in this present studies.
Conclusion: Gives idea to a common man regarding effectiveness of homoeopathic medicine in increasing the quality of yield by improving germination and growth rate without using synthetic chemicals.

Keywords: *Vigna unguiculata* plant, calcarea phosphoricum, centesimal potency, seed priming technique, germination and growth rate, agro homoeopathy

Introduction
Agriculture is the backbone of the Indian economy; more than 50% of Indian people's livelihood directly depends on it, but contributes only 18% of nations GDP. So, India plays great emphasis on natural approach and is willing to expand resources on agro homeopathy and produce applicable results for this country.
Agro homeopathy is a branch of science which deals with using homoeopathic medicineon plants influencing its growth, metabolites production, essential yield, photochemical process and nutritive values when applied on germinating seeds or on growing plants.
The idea of testing the Homoeopathic remedies on plants was invented by Dr. Baron von Boenninghausen. He has quoted in his writings that the medicines which were left out were thrown to his plant pots and observed effect on plants.
Homoeopathic preparation can be applied on the soil, leaves or any part of the plant to increase, decrease the production of bioactive substances and directly increase itsquality.
Modern agriculture practices with an intensive approach (e.g., heavy tillage, synthetic agrochemicals, hybrid varieties and mono cropping) may further deteriorates fragile lands by accelerating the loss of organic matter, degradation of soil and environmental damage (deterioration of water and air quality, loss of biodiversity, and biomagnifications) thus, several attempts have been carried out to achieve ecosystem stability. Vital aspects of crop improvement through maintaining sustainability can be accomplished by modulating the metabolism of seed that would be achieved by seed priming technique.

What is seed priming technique?
Seed priming is pre sowing seed treatment that allows controlled hydration of seeds toimbibe water and go through the first stage of germination but does not allow radicalprotrusion through the seed coat.

The aim is to develop natural, simple and inexpensive methods to increase agricultural production without using synthetic chemicals, so that a wide range of agricultural hazards can be controlled. This study is an affordable therapeutic treatment used in cultivation of plants. With an increase in the number of farmers and researchers are opting for natural and organic methods of farming this study would be useful. With the development in the field of agriculture, there is increased in organisms affecting the plants, hence using of homoeopathic in agriculture as a conventional agriculture way to maintain agro-ecological balance in this field is essential.

Article by department of food science and technology, university of reading, UK States that optimization of germination process of cowpea by response surface mythology is 8 hours with germination time as 52 hrs, hence this research is done as a part of continued study.

Why Calcarea phosporica?

Calcarea phosporica is one of a twelve tissue salts Proved by - Schussler

Scientific name is Phosphate of lime

Common name is Calcium Phosphate

Calcium and phosphate is a vital component of soil required for the plant growth

Soil studies show that calcium and phosphate was less in Mangalore soil hence we have chosen thismedicine

Why in centesimal potency?

Dr Borieck Material Medica says Dose – First to third trituration. Higher potencies often more effective.

Agro homeopathy repertory says

Leaves; MARGINS; yellow- calcarea phos
Leaves; Dry- calcarea phos
Leaves; Leathery-calcarea phos
Leaves; Rolled- calcarea phos
Leaves; Wrinkled- calcarea phos
Named Diseases; Mildew- calcarea phos
Named Diseases; Sooty- calcarea phos
General; Brittle- calcarea phos
General; Discoloration; brown- calcarea phos
General; Straggly; calcarea phos
Generative; Pollination; excessive- calcarea phos
Generative; Stamen; long- calcarea phos
Fruits; Rotting- calcarea phos
Epidermis; Cracks- calcarea phos
Epidermis; Thin- calcarea phos

Study Design: 40 seeds of cow pea will be selected after certified by Botanist.

20 seed will be soaked in 2 jars respectively for a period of 8 hrs for seed priming technique.

Coder will be assessing the jars, medicine and hence principal investigator or guide is unaware of the procedure.

20 seeds will be put in one jar and medicine Calcarea Phosphorica 200 C (1drop of medicine with 50 ml of distilled water) will be introduced in one jar and labeled as S1(Experiment group).

20 seeds will be put in one jar and medicine (1 drop of rectifying spirit with 50ml of distilled water) will be introduced in another jar and labeled as S2 (control group).

After 8 hrs the seeds will be shifted to respective grow bags filled with soil and drainage holes. Regular monitoring will be made for a period of 10 days (to avoid insects or to regulate water content and to regulate temperature) and will be labeled as S1, S2 respectively.

Regular watering will be done morning and evening, everyday with normal water and factors like germination and growth rate will be recorded for 10 days.

On 11 th day the germinated seed shoot length and root length will be measured using thread and scale and will be assessed for germination rate.And these seeds will be introduced into their respective grow bags and will be named as S1a, S1b.S1c, and S1d….S2a, S2b, S2c, S2d…regular watering and monitoring will be done for at respective time intervals for aperiod of 3 months.

At the end of 3 months plants will be removed from the soil, weight and shoot length will be measured and considered to be fresh weight.

For dry weight the plants are then kept in hot air oven to and dried at 110'Ffor 5hrs at and weight will be measured.

The observations are as followed

Table1: S1 Experiment group data's in centimeters on respective dates. (SHOOT in CMS)

S1(days)	1	2	3	4	5	6	7	8	9	10	11	1 Month	2 Month	3 Month
A		1	3	14	15	16	18	18.2	19	21	23	60	98	149
B		2	4	12	16	17	18	18.3	19	22	23	117	202	308
C		1.5	3	10	12	15	16	17.8	18	20	22	80	139	249
D		3	6	15	16	17	18	19	22	23.5	24.7	115	230	410
E		2	5	14	15	16	18	20	21	22	23	110	200	400
F		1	3	8	9	10	11	11.7	15	19	22	86	112	203
G		1	3	7	10	10.8	11	11.9	15.3	18	20	87	115	205
H		2.1	3	7.5	10	11	12	15	18	21	22	122.5	220	387
I		1.7	2	8.5	11	12	13.5	14	16	18	21	60	78	100
J		1	2	6	11	13	15	15.8	16	18	20	78	130	212
K		2	3	6	12	12.7	15	18	19	20	21.5	40	60	88
L		1	2	5	11	12	13	15	18	20	22	40	68	84
M		2	4	12	13	14	15	18	19	21	22.7	88	122	217
N		0	3	13	14	15	16	19	19.7	22	23	90	150	273
O		0	4	11	13	15	16	19	20	21	23	60	100	168
P		0	4	10	13	16	18	19	20	22	24	125	206.5	306
Q		0	4	9	12	14	17	19	20	21	23	97.5	198	259
R		0	3	6	9	10	10.2	12	13	18	19	48	57	79
S		0	0	7	9	9.5	10	10.5	14	20	21	47.5	55	70
T		0	0	0	3	6	7	12.5	19	20	21	45	50	66

Table 2: S2 Control group data's in centimeters on respective dates. (SHOOT in CMS)

S2	1	2	3	4	5	6	7	8	9	10	11	1 Month	2 Month	3 Month
A		1	2	6	7	8	11	13	15	20	21	82	126	200
B		0.5	2	6	8	10	13	15	18	19	20	86	133	176
C		2	4	13	14.5	15	17	18	21	21.5	22.5	110	191	245
D		1	1.5	5	8	12	15	16	16.5	18	20	49	91	117
E		1	2	10	12	13	14	14.5	16	17	20	52	100	129
F		1.7	2	6	9	11	12	12.7	13	16	20	30	56	100
G		0	3	5	9	11.5	12	12.2	13	15	19	25	35	45
H		0	4	8	12	12.7	14	15	18	21	22	86	123	210
I		4	4	8	12	13	15	17	19	21	22	36.2	53	70
J		0	0	11	11.5	15	16	16.5	17.8	20	22.7	42	98	113
K		0	0	10	11.5	14	15	16	17.7	20	22.5	30	51	68
L		0	0	7	12	14	14	15.5	16	17	19	29	59	73
M		0	0	7	11	13	13	15	16.2	17	19	30	60	78
N		0	0	6	11	12.6	13	15	17	18	20	26	38	49
O		0	0	6	10	12.8	15	16	18	20	21	28.5	35	0
P		0	0	6	10	13	14	16	18	20	22	28	32	0
Q		0	0	5	9	10	11	14	17	19	21	24	0	0
R		0	0	0	0	12	12.5	13	15	18	21	23	0	0
S		0	0	0	0	0	0	0	0	16	19	0	0	0
T		0	0	0	0	0	0	0	0	17	20	0	0	0

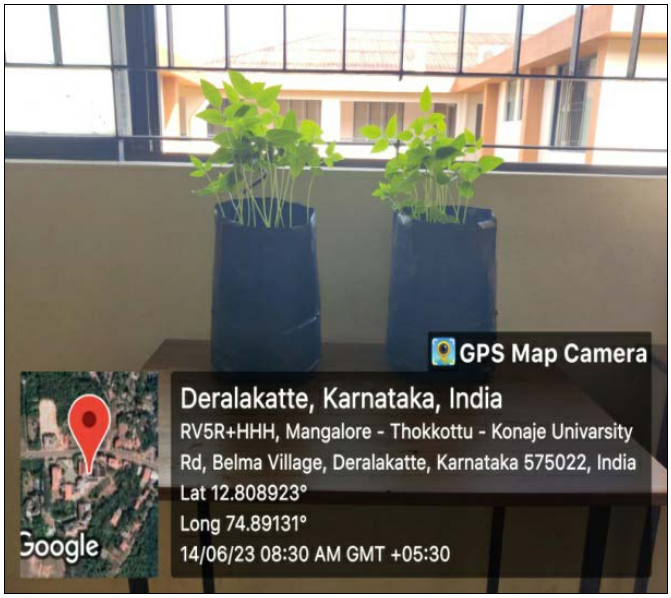

Fig 1: Shows the seed soaking, germination and growth of the plant

Table 3: Length of the root in centimeters on 11th day and 3 months (ROOT in CMS)

S1	11th Day	3 Month	S2	11th Day	3 Month
A	30	12.5	A	20	11
B	32	10	B	29	22
C	44	5.5	C	30	16
D	28	15	D	24	5
E	24	11	E	10	15
F	30	5	F	15	5
G	27	12	G	15	7
H	30	6	H	15	13
I	26	11	I	15	10
J	23	4	J	28	13
K	21	23	K	21	7
L	30	21	L	25	7
M	23	7.5	M	15	5
N	17	8	N	16	7
O	26	8	O	17	
P	32	9	P	9	
Q	34	8	Q	14	
R	20	10	R	22	
S	32	11	S	21	
T	26	8	T	19	

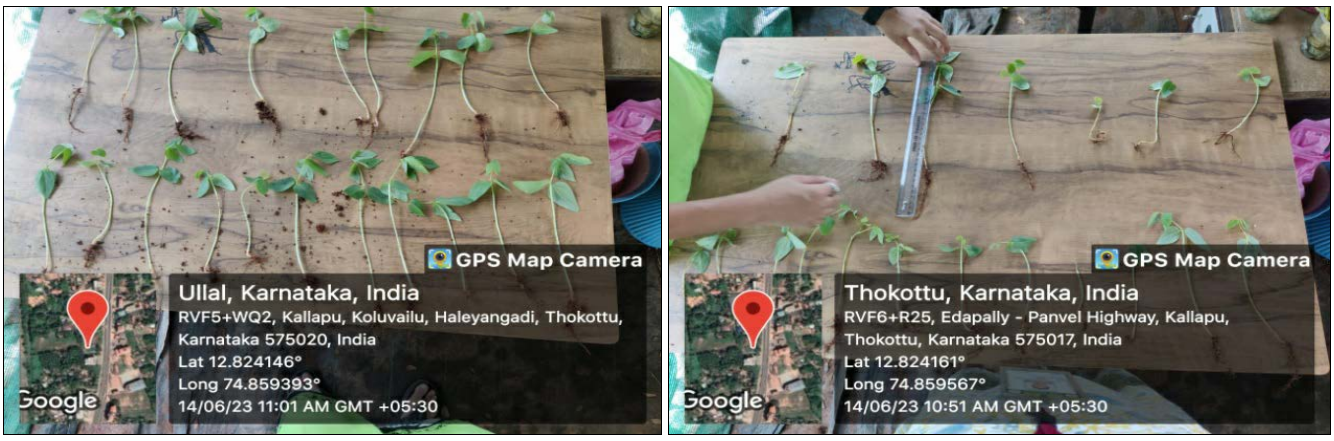

Fig 2: Shows the root length of the plant

Table 4: Dry weight and wet weight of the plant Number of pods by the end of 3rd month

	S1	S2
Fresh weight	241.4	109.7
Dry weight	54.4	18.9
No of pods		
S1	14	
S2	1	

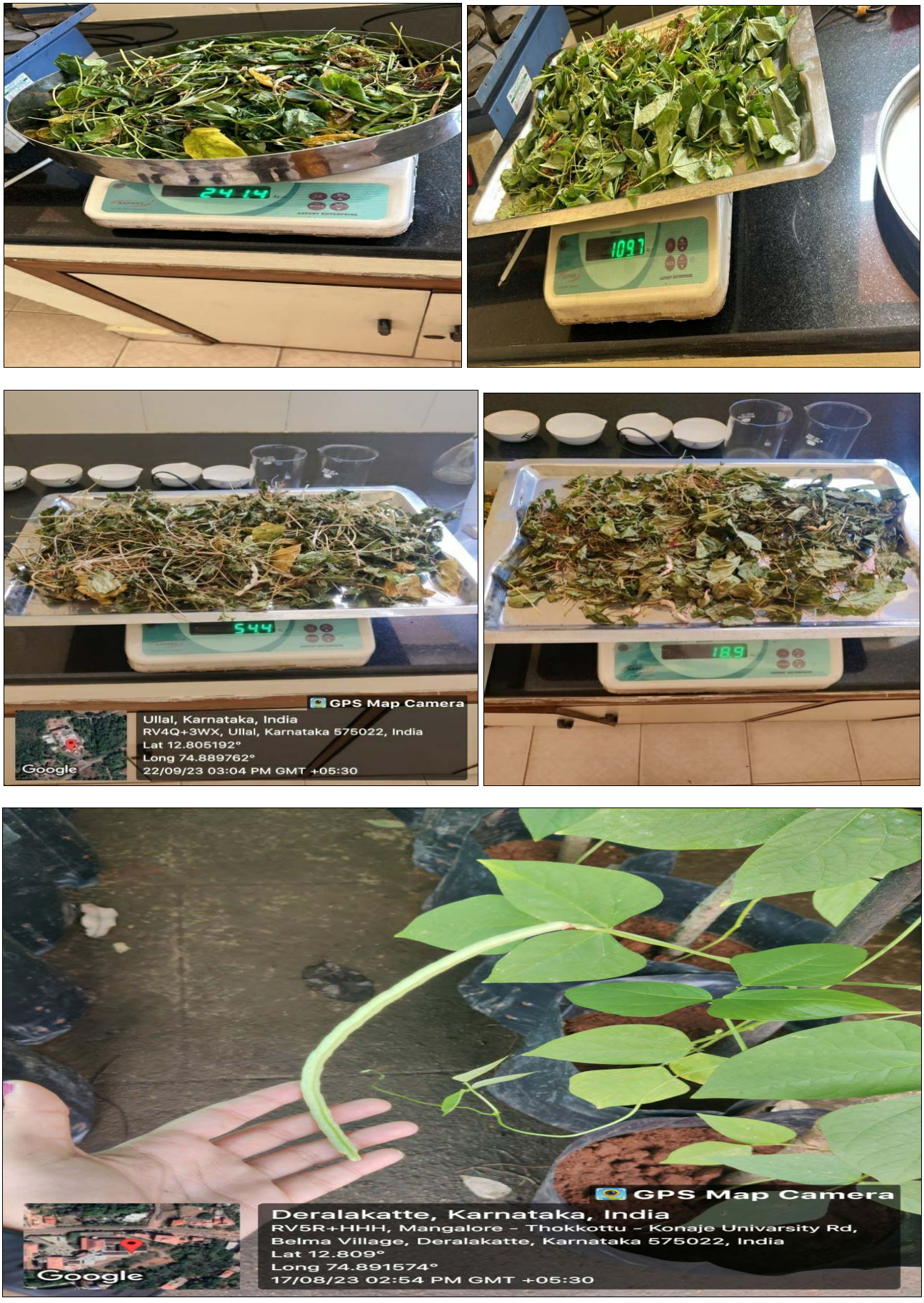

Fig 3: Shows the wet weight and dry weight of both the group. Also shows the pod.

Statistical analysis and results

Table 5: Statistical data

Tests of Normality					
	Group	Kolmogorov-Smirnov[a]		Shapiro-Wilk	
		Statistic	Sig.	Statistic	Sig.
q11	Experiment	.150	.200*	.956	.467
	Control	.263	.010	.861	.031
Month1	Experiment	.156	.200*	.927	.136
	Control	.200	.134	.825	.010
Month2	Experiment	.170	.134	.910	.065
	Control	.225	.054	.904	.128
Month3	Experiment	.140	.200*	.928	.140
	Control	.169	.200*	.903	.125

Table 6: Statistical data

Descriptive			
	Group		Statistic
q11	Experiment	Mean	22.0450
		Median	22.0000
		Std. Deviation	1.41402
		Minimum	19.00
		Maximum	24.70
		Range	5.70
		Interquartile Range	2.00
	Control	Mean	20.6929
		Median	20.0000
		Std. Deviation	1.38867
		Minimum	19.00
		Maximum	22.70
		Range	3.70
		Interquartile Range	2.38
Month1	Experiment	Mean	79.8250
		Median	83.0000
		Std. Deviation	28.64404
		Minimum	40.00
		Maximum	125.00
		Range	85.00
		Interquartile Range	55.88
	Control	Mean	50.9429
		Median	39.1000
		Std. Deviation	28.15478
		Minimum	25.00
		Maximum	110.00
		Range	85.00
		Interquartile Range	53.25
Month2	Experiment	Mean	129.5250
		Median	118.5000
		Std. Deviation	60.90361
		Minimum	50.00
		Maximum	230.00
		Range	180.00
		Interquartile Range	129.00
	Control	Mean	86.7143
		Median	75.5000
		Std. Deviation	44.79428
		Minimum	35.00
		Maximum	191.00
		Range	156.00
		Interquartile Range	71.25
Month3	Experiment	Mean	211.6500
		Median	208.5000
		Std. Deviation	112.40307
		Minimum	66.00
		Maximum	410.00
		Range	344.00
		Interquartile Range	206.75
	Control	Mean	119.5000
		Median	106.5000
		Std. Deviation	64.23485
		Minimum	45.00
		Maximum	245.00
		Range	200.00
		Interquartile Range	112.50

Table 7: Statistical data

Group Statistics					
	Group	N	Mean	Std. Deviation	t
q11	Experiment	20	22.045	1.414	3.206
	Control	20	20.685	1.265	p=0.003 hs
Month1	Experiment	20	79.825	28.644	3.811
	Control	18	45.372	26.880	*p*<0.001 vhs
Month2	Experiment	20	129.525	60.904	2.699
	Control	16	80.063	45.494	p=0.011 sig
Month3	Experiment	20	211.650	112.403	2.760
	Control	14	119.500	64.235	p=0.009 hs

Table 8: Statistical data

Descriptive						
q11						
Group		N	Mean	Std. Deviation	Minimum	Maximum
Experiment	Day 11	20	22.045	1.414	19.000	24.700
	One month	20	79.825	28.644	40.000	125.000
	Two months	20	127.475	58.115	50.000	230.000
	Three months	20	211.650	112.403	66.000	410.000
	Total	80	110.249	94.503	19.000	410.000
Control	Day 11	20	20.685	1.265	19.000	22.700
	One month	20	55.835	44.364	23.000	202.000
	Two months	14	73.000	44.232	32.000	191.000
	Three months	14	119.500	64.235	45.000	245.000
	Total	68	62.138	54.551	19.000	245.000

Table 9: Statistical data

ANOVA			
q11			
Group		F	p
Experiment	Between Groups	30.548	<0.001 vhs
Control	Between Groups	15.177	<0.001 vhs

Post Hoc Tests

Table 10: Statistical data

Multiple Comparisons				
Dependent Variable: q11				
Bonferroni				
Group	(I) period	(J) period	Mean Difference (I-J)	p
Experiment	Day 11	One month	-57.780	.037 sig
		Two months	-105.430	<0.001 vhs
		Three months	-189.605	<0.001 vhs
	One month	Two months	-47.650	.137
		Three months	-131.825	<0.001 vhs
	Two months	Three months	-84.175	<0.001 vhs
Control	Day 11	One month	-35.150	.068
		Two months	-52.315	.005hs
		Three months	-98.815	<0.001 vhs
	One month	Two months	-17.165	1.000
		Three months	-63.665	<0.001 vhs
	Two months	Three months	-46.500	.032 sig

Group Statistics				
	Group	N	Mean	Std. Deviation
Length of the root- - 11thday	Experiment	20	27.750	5.928
	Control	20	19.000	5.982
Length of the root- - 3 months	Experiment	20	10.275	4.852
	Control	14	10.214	5.071

Table 11: Statistical data

Independent Samples Test		
	t-test for Equality of Means	
	t	p
Length of the root- - 11thday	4.646	<0.001 vhs
Length of the root- - 3 months	.035	.972

Table 12: Statistical data

Paired Samples Statistics				
Group		**N**	**Mean**	**Std. Deviation**
Experiment	Length of the root- - 11thday	20	27.750	5.928
	Length of the root- - 3 months	20	10.275	4.852
Control	Length of the root- - 11thday	14	19.857	6.371
	Length of the root- - 3 months	14	10.214	5.071

Table 13: Statistical data

Paired Samples Test						
Group			**Paired Differences**		**t**	**p**
			Mean	**Std. Deviation**		
Experiment		Length of the root- - 11thday - Length of the root- - 3 months	17.475	8.320	9.393	<0.001 vhs
Control		Length of the root- - 11thday - Length of the root- - 3 months	9.643	6.380	5.655	<0.001 vhs

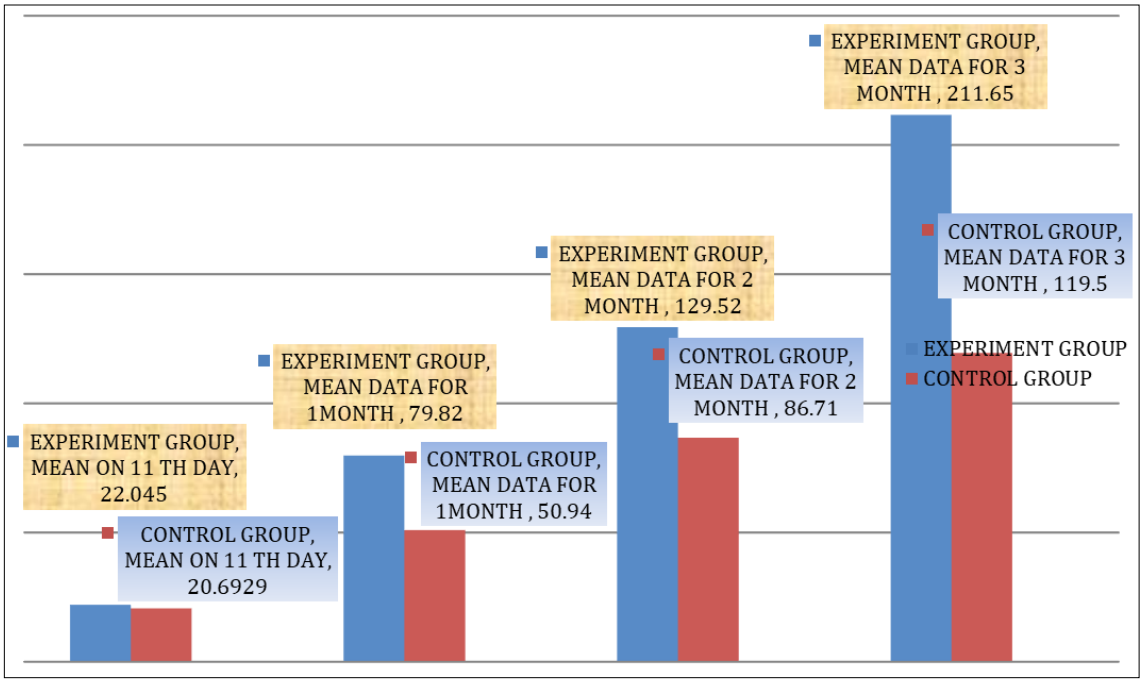

Fig 4: Graphical representation of length of the root of both experiment group and control group

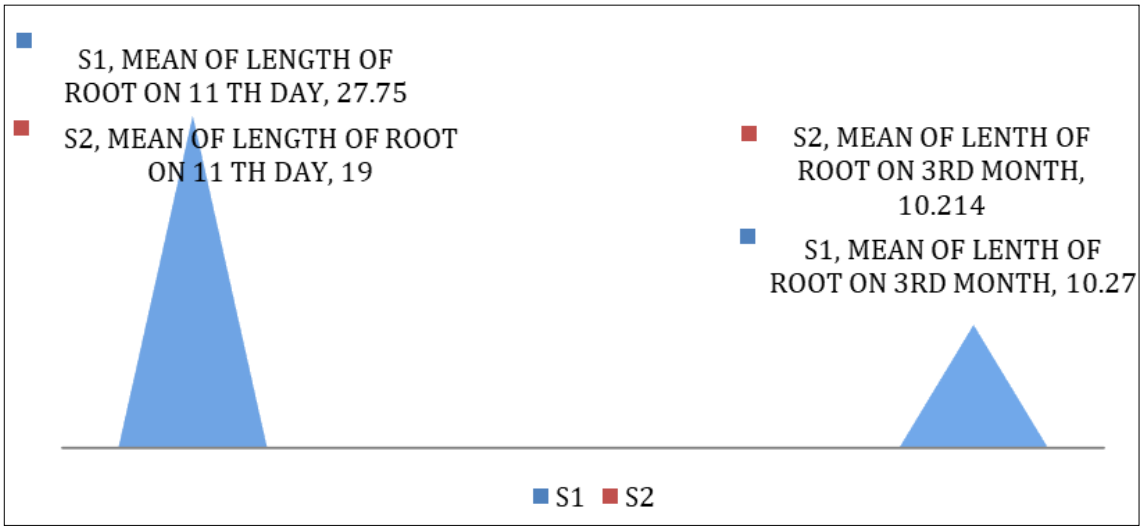

Fig 5: Graphical representation of lenth of the root of both experiment group and control group

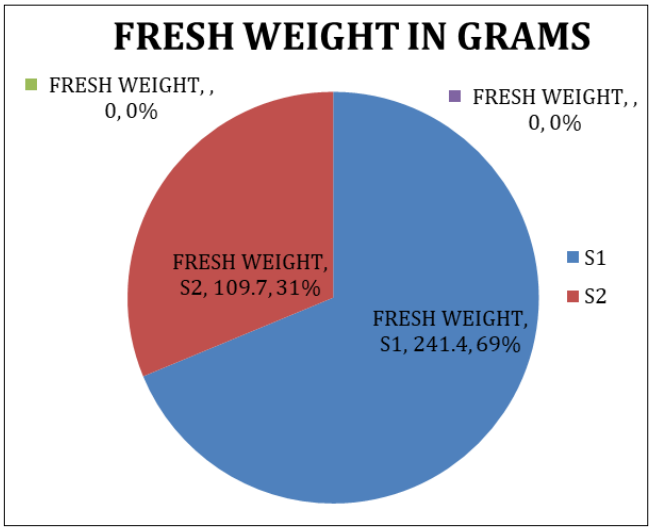

Fig 6: Shows the graphical representation of fresh weight of both experiment and control group

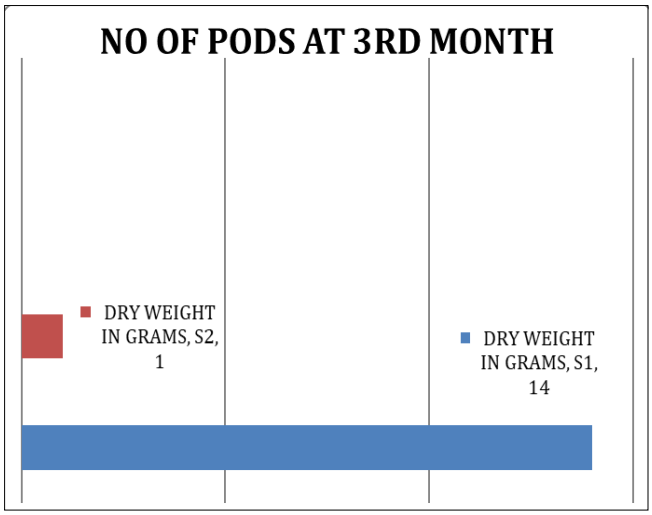

Fig 7: Shows the graphical representation of no of pods by the end of third month of both experiment and control group

Discussion

The study which is conducted using plant has more effective study. Where the P value is greater than .05

Results: p value Effective study

The P value is $p<0.5$ experiment group is proved to be effective than control group.

Conclusion

This study suggest that Agrohomoeopathy is less harmful than conventional method of farming which is practiced worldwide. Thus it will be helpful to the farmers in the means of cost effective farming as well as the buyers who will be consuming healthy vegetables. Thus the above mentioned data proves statistically and scientifically that Agrohomoeopathy is the best method of farming with the evidence.

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Conflict of Interest

Not available

Financial Support

Not available

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