Effect of varied phases of lunar on the growth and yield parameters of rice varieties

ABSTRACT

Aim: To understand and reason out the effect of lunar phases on the rice crop growth and development.
Study design: Experiment was laid out in Factorial Randomized Block Design.
Place and duration of study: Field trial was conducted in the wetland farm of Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during the Navarai season (Dec. 2021 – Apr. 2022)
Methodology: Treatment consists of two factors *viz*., Sowing date (4 Nos.) weekly sowing with respect to lunar phases – New moon, first quarter, full moon and third quarter) and Varieties (4 Nos.) in which two organic (i.e. Kullakar, Karunkuruvai) and two conventional varieties (ADT 43, ASD 16). Normal cultivation practices were followed as per the Tamil Nadu Crop Production Guide 2021.
Results: The pooled mean value revealed that the seeds sown at full moon gave significant positive influence on the growth parameters such as plant height, number of tillers, leaf area index and dry matter production compared to other sown dates. Whereas the treatments that had flowering stage synchronized with full moon phase were produced more yield and dry matter content.
Conclusion: The rice varieties sown in full moon phase exhibited superior growth on compared to other lunar phases and the treatments had flowering synced with full moon phase resulted with more yield and dry matter production.

Keywords: *Rice, lunar phase, flowering, sap flow, lunar gravity.*

1. INTRODUCTION

World population is rising at a rapid pace, the Indian population is not an exceptional and it was marked as 139 crores during 2021 [8]. The food security is a major issue in the developing countries, as cultivable land is shrinking due to diversion for other sectors and dwelling purpose. Rice (*Oryza sativa* L.) is the staple food for more than half of the world population and by 2025, over 2.7 billion people require 800 million tonnes of rice. In India, one and half billion plus population would require 120 million tonnes of rice by 2030. The rice productivity is influenced by many physio-chemical and biological factors. Our ancestors had managed these factors using their experiences and Indigenous Technical Knowledge (ITKs) gained from their forefathers to sustain the crop production [5].

Astrometeorology is a great science came from way back in 3rd century BC, by which weather prediction is done with celestial geometry of stars and planets by observation and prediction. Biodynamical calendar is a subcomponent of Astrometeorology, where the lunar phases are taken in to account in crop production. The moon is very nearest celestial body to the earth and its impact is more proliferate than others. For example, in most coastal regions and estuaries, tides rise and fall twice in a lunar day at intervals of around 12.4 hours (tidal cycles), mirroring the lunar day of 24.8 hours. Each semi-lunar cycle, or 14.77 days, the amplitude of succeeding tides is similarly modified. As a result, spring tides, or the greatest tides, occur when the Sun and Moon are in line with the Earth (i.e., the full moon and new moon), whereas neap tides, or the lowest tides, appear when the Sun-Earth axis and the Moon-Earth axis are at right angles (90°) to one another (i.e., first quarter and third quarter) [10,11].The atmosphere and the crust of the Earth are also affected by these tidal forces caused by the Moon and Sun [2].

Ancient people's culture and calendar reveals that when to carry out all the agricultural practices like sowing, layer, graft, prune, transplant based on whether they are annual or perennial plants, vegetables, cereals and grains, tubers, bulbs and rhizomes. Earlier researches indicated that the lunar phases influences crop production with their varying gravitational pull on the water and indirectly the sap flow of the plants, which will in fact useful for the growth and nutrients absorption [10].

2. MATERIALS AND METHODS

2.1 Experimental location

Field experiment was conducted at Wetland farm of Tamil Nadu Agricultural University, Coimbatore during January to May 2022 (Navarai season). The long period (1991 – 2021) average rainfall of study location for the said four months is 183 mm and received in 10 rainy days. The actual rainfall received during the trial period was 86 mm and in 8 days. The long period mean maximum, minimum temperature, morning and afternoon relative humidity were 33.4°C, 22.1°C, 84.4 per cent and 43.0 per cent, respectively. The actual mean maximum, minimum temperature, morning and afternoon relative humidity during the experiment period was 32.9°C, 22.4°C, 83.1 per cent and 46.3 per cent, respectively.

2.2 Soil characteristics

The soil of study location is classified as 'Perianaickenpalayam series' as per the Soil Survey and Land Use Organization, Tamil Nadu, 1972, that consists of black soil over lying the red calcareous soil developed on calcareous gneisses. The soil is deep to very deep, moderately well drained and clayey. The black soil has a thickness ranging from 25 to 40 cm underlined by the red soil which consist of more than 60 to 70 per cent lime concretions. Due to constant puddling of the soil under wet rice cultivation the whole profile has become a mixed one.

2.3 Methodology

Experiment was conducted in Factorial Randomized Block Design (FRBD) with two factors and replicated thrice.

i. Sowing date (4 Nos.) with weekly sowing with respect to lunar phases viz., a. new moon, b. first quarter c. full moon and d. third quarter in order to ensure that each sowing date has to met different stages of lunar phases at their equal growth stage, particularly at flowering.
ii. Rice Varieties (4 Nos.) in which two organic rice varieties a. Kullakar (120 days) and b. Karunkuruvai (125 days), two conventional rice varieties c. ADT 43 (110 days) and d. ASD 16 (115 days) for ascertaining the performance of organic and inorganic varieties.

Other than the treatments, cultivation practices and nutrient management were followed as mentioned in the Tamil Nadu Crop Production Guide 2021. First set of seeds were sown at 10.1.2022 (First quarter), 17.1.2022 (Full moon), 24.1.2022 (Third quarter) and 31.1.2022 (New Moon). Transplanting was done @ 21 DAS for all the varieties. Each treatment replication was planted in 3.4m x 5m (17 sq.m) sized plot and the results were up scaled for one ha. Necessary buffer area were given between organic and inorganic plots.

Observation for the plant height, number of tillers, Leaf Area Index (LAI) Dry Matter Production (DMP) at maximum tillering, 50 per cent flowering and maturity phases, yield attributes were taken and statistically analysed as given by Gomez [7]. The statistical analysis was carried out using R programming software with statistical tools.

3. RESULTS AND DISCUSSION

Results obtained from the field experiment are presented and discussed hereunder.

3.1 Plant height

Plant height had a wide scale of values between 68.9 cm to 86.8 cm during 50% flowering stage. In the treatment interactions maximum plant height was observed in new moon sown Karunkuruvai variety as 86.2 cm which was on par with first quarter sown Karunkuruvai variety 86.8 cm, full moon sown conventional variety Kullakar variety 86.5 cm and the least height was observed in third quarter sown Kullakar variety with 72.9 cm. On comparing the lunar phase factor, full moon sown varieties showed good plant height (83.3 cm) and least by the third quarter sown varieties (77.7 cm). By varieties, Karunkuruvai variety exhibited maximum height 86.1 cm and least by ADT 43 variety 75.0 cm as shown in table1.The new moon phase takes up the water along with the nutrients to the root zone thereby it started showing good growth.[4, 12].

3.2 Number of tillers

The no. of tillers was varied from the range of 12 to 26 nos. at 50% flowering stage and Slight level of significant difference found on comparing the interactions as new moon sown Karunkuruvai variety 22nos on par with new moon sown ADT 43 variety 24nos. Number of tillers at 50 per cent flowering stage showed no significant difference on lunar phase factor. Observing the varieties Karunkuruvai variety 23nos. showed little variation from others at par with ADT 43 variety 23nos. and least for ASD 16 variety 16 nos. as shown in table1.The slight significant difference obtained may be due to the normal spacing given for planting on comparing to high density planting [13, 15].

3.3 Leaf Area Index

The Leaf Area Index at the 50% flowering stage varied between values from 3.9 to 6.4. In 50% flowering stage, the treatment combination wise full moon sown ASD 16 variety has more LAI 2.82 followed by full moon sown Kullakar variety 5.9 on par with full moon sown Karunkuruvai variety 5.7 with least LAI on first quarter sown Karunkuruvai variety (3.9). At the lunar phase combinations full moon sown varieties gave good LAI 5.9 and least by first quarter phase 4.2 as shown in table1. In varieties Karunkuruvai showed good LAI on par with ADT 43 and ASD 16 as 5.0. The poorest LAI were found in Kullakar 4.6. This is due to the moon's gravitational pull acting over the earth at the full moon phase on sowing and also the full moon phase synced varieties at their respective growing stages showed good leaf growth which made the difference in the LAI. [9, 12, 14].

3.4 Dry matter production

In yield attributes the dry matter production also varied with the broad range from 4051 $kgha^{-1}$ to 8769 $kgha^{-1}$. At the 50% flowering stage the treatment combination full moon synchronized Karunkuruvai variety gave more dry matter 8769 $kgha^{-1}$ followed by first quarter sown Karunkuruvai variety 7781 $kgha^{-1}$ and lowest dry matter was recorded in new moon sown Kullakar variety 4051 $kgha^{-1}$ In lunar phase factor wise on average first quarter sown varieties showed superior dry matter production 6202 $kgha^{-1}$ on par with third quarter phase 6358 $kgha^{-1}$ and least in new moon 4965 $kgha^{-1}$ sown rice varieties. On variety interactions the Karunkuruvai gave good tonnage of dry matter 7423 $kgha^{-1}$ followed by ASD 16 rice variety 5936 $kgha^{-1}$ and minimal dry matter in Kullakar variety 4938 $kgha^{-1}$ as shown in table2. The treatments which shown highest dry matter were synced with the flowering stage with the full moon phase and so obtained more drymatter content, while the gravitational pull of the full moon and lunisolar gravitational force might have influenced the sap flow and dragged the water from the root to shoot and thereby increased growth and development.[1,3,4,6, 15].

3.5 Grain yield

A remarkable variation in the grain yield was observed in the experimental trial from 2264 kgha^{-1} to 4570 kgha^{-1}.In the overall interactions between the lunar phases and different varieties superior yield was produced by full moon sown ADT 43 variety with tonnage of 4570 kgha^{-1} followed by new moon sown Kullakar variety 3533 kgha^{-1} on par at first quarter sown ASD 16 variety 3880 kgha^{-1} and full moon sown Kullakar variety 3816 kgha^{-1}. Among the factors, first factor (i.e.) lunar phases, the full moon synchronized varieties gave 3644 kgha^{-1} yield on par with third quarter synced varieties as 3454 kgha^{-1} and lowest yield by 3155 kgha^{-1}. On comparing the varieties, Kullakar variety 3508 kgha^{-1} gave good performance on par with ADT 43 3629 kgha^{-1} followed by 3448 kgha^{-1} and poorest yield was found in Karunkuruvai 2548 kgha^{-1} as shown in table2. The treatment combination which was synchronized with the full moon phase yielded more grain as the gravitational pull and the same lunisolar force might have influenced the sap flow which take the water and nutrients more towards the blooming site and the fertilization gets flourished resulting in the quality grain and reduced chaffy grains thereby increasing the yield in the quality and quantity wise.

4. CONCLUSION

The study acknowledged the fact that lunar phases had a unique impact on the crop plants remarkably in full moon and new moon phases. Even though the gravitational pull of the sun is greater than the lunar gravity on the earth, due to nearness to the earth it shows significant impact on the crop plants, trees and animals. The sap flow towards the leaves in full moon and backflow towards root in new moon was well noticed in their respective phases. With this science and research based premises it is good to sow the crops on or nearer to full moon day and syncing it to flower exactly at full moon day. This investment-less follow up may give the expected yield to the farmers by producing good vegetative and reproductive growth with noteworthy outcome.

Table1. Effects of lunar phases on plant height (cm), no. of tillers, LAI in rice varieties during (Jan – May 2022) Navarai 2022 season

Treatments	Plant height at 50% flowering (cm)					No. of tillers at 50% flowering					LAI at 50% flowering				
	D1	D2	D3	D4	Mean	D1	D2	D3	D4	Mean	D1	D2	D3	D4	Mean
L1	72.1	86.2	73.0	80.4	77.9	16	22	24	24	22	4.3	3.9	4.2	4.7	4.3
L2	69.0	86.8	73.7	81.6	77.8	14	25	22	15	19	4.2	4.7	5.6	4.6	4.8
L3	86.6	84.8	80.6	81.2	83.3	26	22	22	13	21	5.9	5.8	5.8	6.4	6.0
L4	68.9	86.8	73.0	82.4	77.8	17	26	23	12	20	4.2	5.8	4.6	4.3	4.7
Mean	74.2	86.2	75.1	81.4		18	24	23	16		4.7	5.0	5.0	5.0	
	L	D	L x D			L	D	L x D			L	D	L x D		
SEd	1.2	1.2	2.4			1	1	3			0.1	0.1	0.1		
CD (0.05)	2.4	2.4	4.9			3	3	6			0.1	0.1	0.2		

Table2. Effects of lunar phases on DMP, grain yield in rice varieties during (Jan – May 2022) Navarai 2022 season

Treatments	DMP (Kgha^{-1}) at 50% flowering					Grain yield (kgha^{-1})				
	D1	D2	D3	D4	Mean	D1	D2	D3	D4	Mean

L1	4051	6019	4398	5390	4965	3533	2375	3036	2567	2878
L2	4453	7781	6123	6452	6202	3230	2264	3250	3880	3156
L3	5013	8769	5031	5920	6184	3816	2595	4570	3596	3644
L4	6233	7124	6092	5983	6358	3454	2957	3657	3759	3454
Mean	4938	7423	5411	5936		3508	2547	3628	3448	
	L	**D**	**L x D**			**L**	**D**	**L x D**		
SEd	78	78	156			153	153	306		
CD (0.05)	159	159	319			312	312	624		

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