

**DISTRIBUTION PATTERN OF WEEDY RICE IN WET SEASON RICE CROP IN THE RED AND LATERITIC BELT OF WEST BENGAL****A. Mukherjee\* and B. Duary**

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**ABSTRACT**

A survey on different species of weedy rice in rice crop fields was carried out in the red and lateritic belt of West Bengal, India during 2010 in the farmers' fields of Purulia, Bankura, Birbhum and parts of Burdwan districts. The Survey of weedy rice was carried out in 81, 77, 75 and 21 villages from 17, 18, 18 and 7 blocks out of 19, 22, 19 and 7 blocks present in Purulia, Bankura, Birbhum and parts of Burdwan district respectively. Four weedy rice species viz. *Oryza rufipogon* Griff., *O. barthii* A. Chev., *O. minuta* Presl. Ex. Presl., *O. nivara* were identified during the survey. It was observed that population of weedy rice was higher in Birbhum district as compared to other districts under the survey. The frequency percentage and absolute density were 54.9 and 0.8, 44.04 and 0.69, 40.4 and 0.57 and 35.7 and 0.43 in Birbhum, Parts of Burdwan, Bankura and Purulia district respectively. Out of 81, 77, 75 and 21 villages under survey the frequency percentage was more than 50 percent in 26, 31, 42 and 11 villages. The damage is likely to increase in subsequent years, if not managed effectively, challenging the rice production system in the districts under survey.

**Key words:** Absolute density, distribution, frequency, weedy rice, red and lateritic belt, rice

**INTRODUCTION**

In rice production, weeds are one of the major yield limiting biological constraints worldwide. Weedy rice, which is a product of the natural hybridization, competes aggressively with the crop, reducing yields and contaminating harvests. It has been identified as one of the most problematic weeds in the 21<sup>st</sup> century which seriously affects rice yields. Weedy rice is now affecting rice areas of various countries in Asia, including India, Malaysia, Sri Lanka, Philippines, Thailand, Viet Nam, and South Korea. It is an emerging problem in many rice-growing areas in Asia (Chouhan and Johnson, 2010; Chauhan and Johnson, 2011 and Azmi et al., 2012). With diverse biotype, weedy rice has already infested more than 50 countries in Asia, Africa and Latin America. In India, weedy rice infestations are seen in West Bengal, Andhra Pradesh, Assam, Bihar, Karnataka, Madhya Pradesh, Orissa, Tamil Nadu and Uttar Pradesh (Abraham and Jose, 2015). This weed contributes to high production costs through a yield reduction. In some areas of the region the weed infestations are so high that rice crop has to be replaced for a while by another crop, a solution that is not everywhere effective and feasible. Weedy rice densities of 35–40 plants m<sup>-2</sup> can reduce yields of tall rice cultivars by 60% and short cultivars by 90%, indicating losses greater than grass weeds (Rathore et al., 2013). In addition to reducing grain yield due to competition, weedy rice also lowers the value of cultivated rice in markets as the coloured pericarps of weedy rice grains contaminate grains of cultivated rice. As weedy rice and cultivated rice are physiologically similar, weedy rice cannot be controlled using selective rice herbicides. The speedy spread of weedy rice in India serves as a warning to rice-growing states. Immediate attention should be given towards investigating the weedy rice infestation, its origin, biology and management. With this background, the survey of different species of weedy rice in wet season rice was carried out to generate information on distribution and intensity of infestation of weedy rice populations under red and lateritic belt of West Bengal.

**MATERIALS AND METHODS**

Survey for predominant species of weedy rice indifferent rice ecosystem in red and lateritic belt of West Bengal was conducted during 2010. The Survey of Weedy rice was carried out in 81, 77, 75 and

21 villages from 17, 18, 18 and 7 blocks out of 19, 22, 19 and 7 blocks present in Purulia, Bankura, Birbhum and parts of Burdwan district respectively. For recording observations on the infestation of weedy rice in rice field a stop was made after every 10 km and site for recording observation was selected 4-5 fields away from the main road so that it could represent an undisturbed situation with natural weed flora. Ten spots were considered in each village. The number of rice field infested with weedy rice was recorded. The species of weedy rice was identified after emergence of panicle or setting fruit.

Ecological analysis of weedy rice infestation was done by traditional quantitative method on the basis of frequency and absolute density. Ten fields in each village were selected randomly and the number of fields in which weedy rice present was recorded. Ten quadrates of 1.0 m × 1.0 m size were thrown in the rice field and number of weedy rice in each quadrate was counted and noted.

**Frequency**

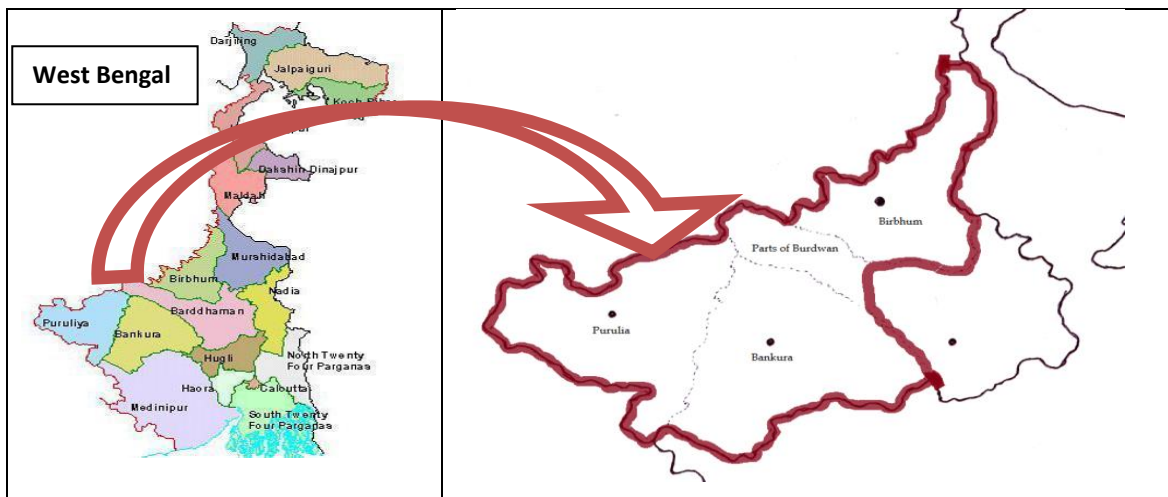
It indicates the number of sampling units in which given species occurs and thus expresses the distribution or dispersion of the species in a community. It is expressed in terms of percentage of the total number of samples. In this, just a record of weedy rice present or absent was made. Percentage frequency was calculated by the following formula.

$$\text{Frequency (\%)} = \frac{\text{Number of fields of occurrence of weedy rice}}{\text{Total number of field studied}} \times 100$$

**Density**

This parameter relates to the counting of individual per unit area.

$$\text{Density (No./m}^2\text{)} = \frac{\text{Total number of individual of weedy rice}}{\text{Total number of quadrat studied} \times \text{area of the quadrat}}$$



**Fig. 1. Grid map and survey area of Purulia, Bankura, Brbhum and parts of Burdwan districts of West Bengal**

**RESULTS AND DISCUSSION**

The survey of weedy rice was carried out in 81, 77, 75 and 21 villages from 17, 18, 18 and 7 blocks out of 19, 22, 19 and 7 blocks present in Purulia, Bankura, Birbhum and parts of Burdwan district respectively. The distribution in terms of the frequency percentage and the absolute density (no m<sup>-2</sup>) were worked out district wise and presented in Table 1 for the districts Purulia, Bankura, Birbhum and parts of Burdwan respectively.

**Purulia District**

Average frequency percentage and absolute density of weedy rice in Purulia District was 35.67% and 0.43 (no m<sup>-2</sup>) respectively. Again it expressed that 29 villages of Purulia District were under the frequency of less than 25%, 26 villages between 25-50%, 19 villages from 51-75% and only 7 villages were having more than 75% frequency of weedy rice infestation.

**Bankura District**

In Bankura district the average absolute density (no m<sup>-2</sup>) was 0.56 and the average frequency percentage was 40.39. According to the frequency out of 77 villages 24 were under less than 25%, 22 villages under 25-50%, 27 villages under 51-75% and only 4 villages were having more than 75% frequency in the Bankura districts.

**Birbhum District**

From the Table 1 & 2 where the frequency percentage and absolute density (no m<sup>-2</sup>) were presented of Birbhum district it revealed that the average frequency percentage was 54.93% in Birbhum district and the absolute density was 0.80. Among 75 villages in the district 24, 9, 12 and 30 villages were under less than 25, 25-50, 51-75% and more than 75% frequency percentage respectively.

**Parts of Burdwan District**

Twenty one villages in the parts of Burdwan district were surveyed and the average frequency percentage was 44.04% and the absolute density was 0.695. According to the frequency percentage levels, out of 21 villages 10 were under the category of frequency percentage less than 25%, no village comes under the categories where the frequency percentage was 25-50%, 2 villages registered the value in between 51-75% frequency and 9 villages were under more than 75% frequency (Table 2).

**Identification and studies on distribution of different weedy rice species**

Four weedy rice species were identified during the survey of Purulia, Bankura, Birbhum and parts of Burdwan districts which come under the red and lateritic belt of West Bengal. The identified 4 weedy rice species were *Oryza rufipogon* Griff., *O. barthii* A. Chev., *O. minuta* Presl. Ex. Presl., *O. nivara* [Plate 1(a-d)].

After identifying the species, the distribution of the four species over the four districts under study was studied.

**Occurrence of *Oryza rufipogon***

Out of 81 villages surveyed 4 weedy rice species were observed in 53 villages out of which *Oryza rufipogon* was noticed in 52 villages in Purulia district. In Bankura district out of 77 villages surveyed 55 were infested by weedy rice species out of which *Oryza rufipogon* was found in 54 villages. From the Table 6 it revealed that 55 villages were infested by the species *Oryza rufipogon* out of 55 villages where infestation of weedy rice species was noticed in Birbhum district. Out of 21 villages surveyed weedy rice was found in 11 villages and in all those villages *Oryza rufipogon* was found in parts of Burdwan district (Fig. 2).

**Occurrence of *Oryza nivara***

From the Table 2 it revealed that 22, 23, 31 and 5 villages were infested by the species *Oryza nivara* in Purulia, Bankura, Birbhum and parts of Burdwan districts where the total number of village surveyed and occurrence of weedy rice was 81, 77, 75, 21 and 53, 55, 55, 11 respectively (Fig. 3).

**Occurrence of *Oryza barthii***

Table 2 expressed the number of villages of Purulia, Bankura, Birbhum and parts of Burdwan districts where *Oryza barthii* was found and the it was 19, 30, 34 and 5 respectively (Fig. 4).

### Occurrence of *Oryza minuta*

Out of 81, 77, 75 and 21 villages surveyed, the species *Oryza minuta* was observed in 10, 18, 25 and 5 villages (Table 2 and Fig. 5).

**Table 1. Frequency and absolute density of weedy rice in the red and lateritic belt of West Bengal**

Name of the districts	Frequency (%)	Absolute density (No./m <sup>2</sup> )
Purulia	35.7	0.43
Bankura	40.4	0.57
Birbhum	54.9	0.80
Parts of Burdwan	44.0	0.70

**Table 2. Number of villages under different frequency percentages of different districts of red and lateritic belt of West Bengal**

Name of the districts	Number of Villages according to the frequency percentages			
	< 25 %	25-50%	51-75%	>75%
Purulia	29	26	19	7
Bankura	24	22	27	4
Birbhum	24	9	12	30
Parts of Burdwan	10	0	2	9

From the results it revealed that during the survey year the weedy rice infestation was higher in Birbhum district followed by Burdwan, Bankura and then Purulia. Infestation of any weed species depends on many factors. It might be due to the rice ecosystem, types of soil, amount and frequency of rainfall and depth of water standing in rice field and cropping system of the district. Most of the rice fields in Birbhum district are under high to medium land where water depth is less and many a times, depending on the rainfall, the soil remains only moist with a situation just like direct seeded rice. Similar findings were reported by Jana and Mallick (2013). The occurrence of weedy rice may also be higher in fields planted with farmers' own seeds than that of paddy fields cultivated with certified seeds, and the longer the period farmers' seeds were used, the more weedy rice occurred in paddy fields. Similar results were reported by Cho et al. (1998).

### CONCLUSION

Infestation of weedy rice was observed in all the four districts under survey in the red and lateritic belt of West Bengal. Four species of weedy rice viz. *O. rufipogon*, *O. nivara*, *O. barthii* and *O. minuta* were recorded to infest rice field of the districts under survey i.e. Purulia, Bankura, Birbhum and parts of Burdwan. Weedy rice species were found in about 65.4, 72.4, 73.3 and 52.4% villages of Purulia, Bankura, Birbhum and parts of Burdwan districts respectively. Among the four species *O. rufipogon* was found to occur most frequently in all the districts under survey. The frequency of occurrence was the highest in Birbhum district followed by Bankura, Purulia and Parts of Burdwan. Absolute density was the highest in Birbhum followed by parts of Burdwan, Bankura and Purulia.

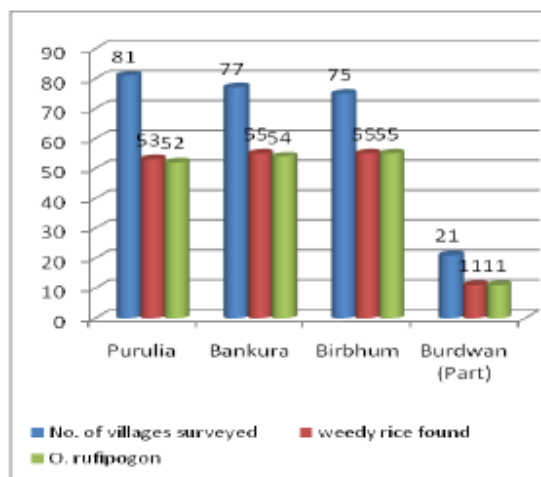


Fig. 2 Infestation of *O. rufipogon* in different districts

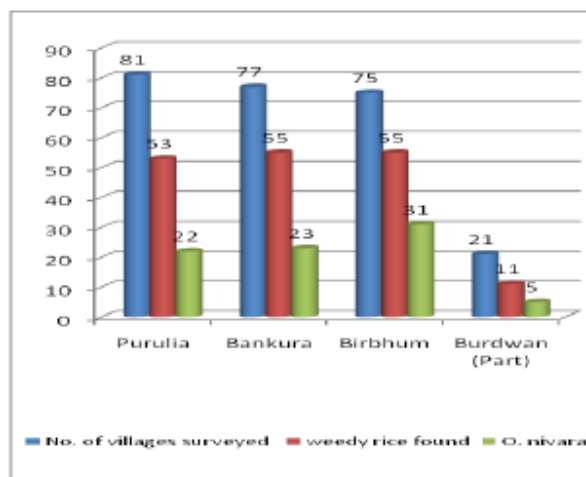


Fig. 3 Infestation of *O. nivara* in different districts

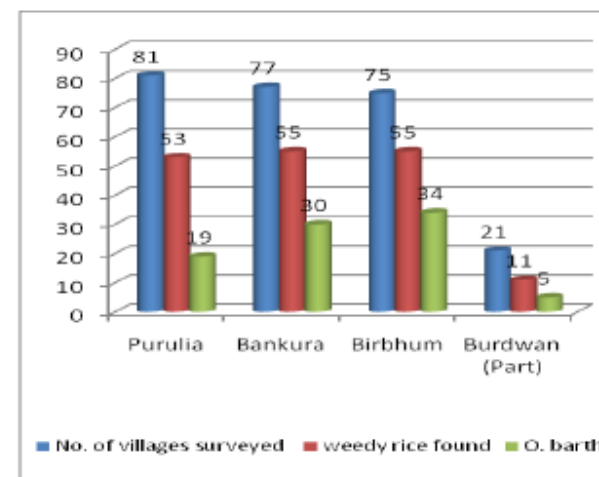


Fig. 4 Infestation of *O. barthii* in different districts

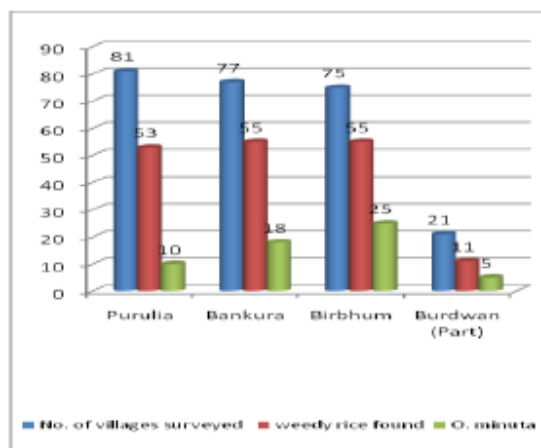


Fig. 5 Infestation of *O. minuta* in different districts

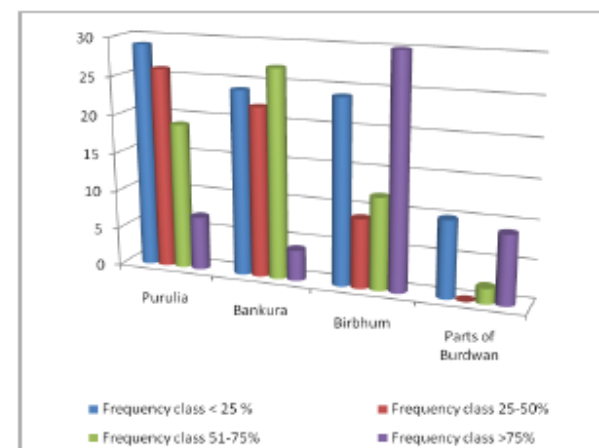


Fig. 6 Number of villages under different frequency percentages of different districts



Plate 1(a).*Oryza rufipogon*



Plate 1(b).*Oryza nivara*



Plate 1(c).*Oryza barthii*

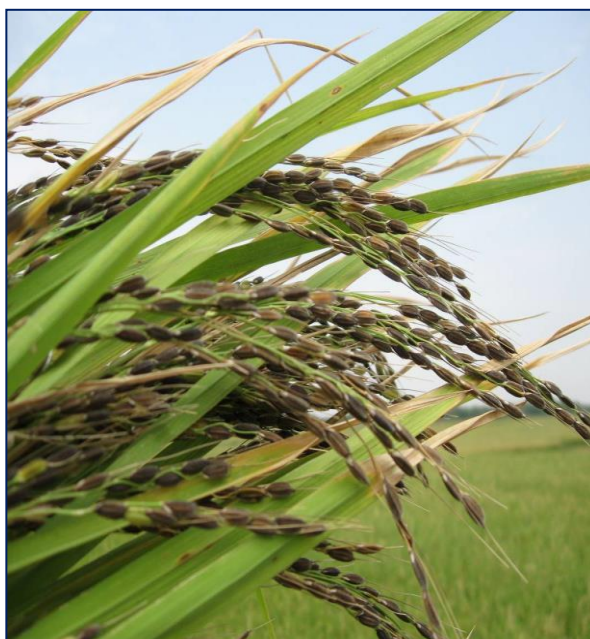


Plate 1(d).*Oryza minuta*

Plate 1(a-d). Four weedy rice species observed in lateritic belt of West Bengal

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