RESEARCH ARTICLE

SCIENTIFIC EVALUATION OF CERTAIN TRADITIONAL KNOWLEDGE (TK) BASED ORGANIC MANURE FOR THE MANAGEMENT OF PEST AND PATHOGENS OF RICE.

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Manuscript Info	Abstract
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The experiment was carried out in a rice field located at Mayang Imphal under Imphal West district of Manipur, during June-July for two consecutive years (2011 and 2012) and pest and disease parameters were recorded. During the experiment, treatments used for each plot ($4m^2$) with a spacing of 20x15cm includes 3 green manure levels (2.5 tons/ha, 5 tons/ha and 7.5 tons/ha of *Colocasiaesculenta* Linn., 3 decomposed cow dung manure levels (2.5 tons/ha, 5 tons/ha and 7.5 tons/ha) and a control check (100-40-30kgNPK/ha). The results of this experiment indicated that the population of stem borer and case worm on the chemical fertilizer treatments exhibited the severe outbreak more than in the treatments of green manure crops and decomposed cow dung manure. Also, the disease incidence of blast and brown spot was also reduced in the respective plots as compared to the control check. The experimental results suggest that certain traditional knowledge based organic manure are quite effective in controlling the menace of pests and diseases of rice crops.

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Introduction:-

Traditional knowledge or indigenous traditional/technical knowledge (ITK) is the knowledge possessed by the indigenous people or the ethnic groups or communities around the world.Though the knowledge covers various aspects of life such as healthcare, education, natural resource management etc., (Warren 1991), the information on traditional agriculture pertinent to the management of pest and pathogens of rice crop diseases has never been recorded or documented in a form easily accessible to the farmers and scientists working in the field. This has provided ample scope for the use of ITKs evolved over generations.Management of rice crops in general and pest and disease management approaches in particular are different among indigenous farmers practicing traditional farming systems in different regions of the world because of difference in indigenous knowledge they accrued over generations of their close contact with the nature. Chhetry et al., (2009) reported that there is a resurgence of interest in recent years in reviving the age old farming system through scientific evaluation, which is known by modern man as organic farming, because of hazardous effect of excessive use of chemical fertilizers and over all ill effects of chemical based products to human health etc., in agricultural system. Kannan (1995) reported that Basmati variety of paddy grown during *rabi* season (January to April) purely on organic basis with liberal quantities of farm yard manure , green leaf manure and neem cake forming the bulk of the basic application gave a more pronounced result in terms of yield and lesser incidence of pest and disease parameters.

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Organic farming is based on enhancing the natural biological cycles in soil, crop and livestock. It involves a wide range of soil management and cropping practices that maintain the balance of the ecosystem and foster ecosystem services (Altieri 1986, 1999, van Bruggen and Semenov 2000).

The experiment was therefore initiated on some selected TKs possessed by the progressive farmers, so as to address the immediate and long-term measures against the two fungal pathogens (*Pyricularia grisea*, causing blast disease and *Drechslera oryzae*, causing brown leaf spot of rice)and two other insect pest of economic importance (yellow stem borer and case worm). And as there is a vast scope of scientific exploration of traditional knowledge of farming communities on different aspects of plant health management, investigation about the traditional knowledge possessed by the farmers for the successful management of pest and pathogens of rice in Manipur valley were carried out.

Materials and Methods:-

As the traditional progressive farmers have been using various organic matters in the form of manure for better yield and also to manage the pests and pathogens of rice crops, an experiment was designed using decomposed cow dung manure and green leaf manure to check their efficacy against pest and pathogens of rice. The experiment was conducted in a rice field located at Mayang Imphal under Imphal West district of Manipur, during June-July for two consecutive years (2011 and 2012) and pest and disease parameters were recorded.

Mode of Preparation of Cow Dung Manure:-

One year old decomposed cow dung was procured from the locality in bulk a week before the preparation of field and stored in shade area and latter applied in the field. This practice of making soil amendments were commonly used by the local farmers since time immemorial. This practice of amending the soil organically is permitted under organic agriculture system (Yadav, 2007).

Experimental Design:-

A randomized complete block design was set up with three replications. Each treatment, having plot size of 4m^2 and spacing of 20X15 cm, includes (i) 3 green manure levels (2.5 tons/ha, 5 tons/ha and 7.5 tons/ha of *Colocasia esculenta* Linn., and (ii) 3 decomposed cow dung manure levels (2.5 tons/ha, 5 tons/ha and 7.5 tons/ha) and a control check (100-40-30kgNPK/ha).

Small ridges were established between plots with different treatments to avoid the influences of nutrition from neighbor plots. The sixty day old green manure crop was freshly chopped into pieces and incorporated during the preparation of soil. 35days old seedlings of rice variety *RCM-9* were transplanted after 10days of soil mixed with different treatments. All management practices were done in proper time starting from land preparation to crop harvest.

The data on severity of blast and brown leaf spot were recorded using the standard visual 0 to 9 ratings scale following the 5thedition of Standard Evaluation System for Rice (IRRI 2013). The disease parameters were worked out using the formulas as given below:

i) Percent disease incidence,

$$DI (\%) = \frac{Total\,no.\,of\,tillers\,infected\,by\,a\,particular\,disease}{Total\,no.\,of\,tillers\,assessed} \times 100$$

ii) Percent disease severity,

$$DS (\%) = \frac{Sum\,of\,all\,numerical\,ratings}{No.\,of\,leaves\,observed \times Maximum\,disease\,rating\,scale\,i.e.,0-9} \times 100$$

Pest Assessment:-
Stem borer:-

Counts were taken on number of dead hearts/white ears head and total number of tillers/panicle from 10 randomly selected hills. The per cent death heart (DH) and percent white ear head (WH) were calculated as follows,

$$\%DH = \frac{No.\,of\,DH/\,Plant}{Total\,no.\,of\,tillers/Plant} \times 100$$

$$\%WH = \frac{No.\,of\,WH/Plant}{Total\,no.\,of\,tillers/plant} \times 100$$

Case worm:-

The leaf damage (LD) intensities of caseworm were assessed by random sampling of 20 hills from each plot of different treatments as mentioned above at fortnightly intervals. The percent damaged leaves were calculated as follows,

$$\%LD = \frac{LD\ no./\ Plant}{Total\ leaves\ /Plant} \times 100$$

Statistical Analysis:-

An analysis of variance (ANOVA) was performed using Microsoft Excel and the difference between the treatment were separated using least significance difference (LSD) test at 5% probability level (i.e., P = 0.05)

Results:-

The population of stem borer and case worm on the chemical fertilizer treatments exhibited the severe outbreak more than in the treatments of green manure crops and decomposed cow dung manure. The population of stem borer and case worm show lesser incidence of 5.27% and 5.44% respectively in a plot treated with green manure crop at a dose of 5 tons/ha followed by 6.97% and 6.79% at a dose of 2.5 tons/ha of the green manure level (Table 1). Similarly, the lowest incidence of stem borer (4.2%) and case worm (8.73%) was recorded from the plots treated with cow dung manure at a dose of 5 tons/ha followed by 6.05% and 12.84% at a dose 2.5 tons/ha as compared to control check (Table 2).

On the other hand the disease incidence of blast and brown spot was also reduced in the respective plots as compared to the control check. The most tolerant reaction for blast (2.40%) and brown leaf spot disease (3.37%) respectively were seen in the plots treated with green manure crop at a dose of 7.5 tons/ha, followed by 2.64% and 3.58% at a dose of 5 tons/ha as compared to control check (Table 3). On the contrary, lowest incidence of blast (2.47%) and brown leaf spot (9.42%) respectively were recorded in the plots treated with cow dung manure at a dose of 5 tons/ha, followed by 4.75% and 12.94% at a dose of 7.5 tons/ha as compared to the control check (Table 4).

Table 1:- Effect of green manure crop on the incidence of insect pests (stem borer and case worm) of rice crop (*RCM-9)*

Green manure level	Stem borer DH/WH	Case worm
2.5 tons/ha	6.97c	6.79c
5 tons/ha	5.27d	5.44d
7.5 tons/ha	9.02b	8.97b
100-40-30kgNPK/ha	9.94a	11.35a
LSD	0.83	0.87

Means within columns followed by different letters are significantly different (P = 0.05)

Table 2:- Effect of decomposed cow dung manure on the incidence of insect pests (Stem borer and case worm) of rice crop (*RCM-9*)

Decomposed cow dung manure level	Stem borer DH/WH	Case worm
2.5 tons/ha	6.05c	12.84c
5 tons/ha	4.2d	8.73d
7.5 tons/ha	7.45b	16.19b
100-40-30kgNPK/ha	8.94a	20.04a
LSD	0.93	2.97

Means within columns followed by different letters are significantly different (P = 0.05)

Table 3:- Effect of green manure on the incidence of blast and brown leaf spot diseases in rice crop (RCM-9)

Green manure level	Blast (%)	Brown leaf spot (%)
2.5 tons/ha	3.05b	5.37b
5 tons/ha	2.64bc	3.58c
7.5 tons/ha	2.40c	3.37c
100-40-30KgNPK/ha	4.33a	7.12a

| LSD | 0.62 | 0.56 |

Means within columns followed by different letters are significantly different (P = 0.05).

Table 4:- Effect of cow dung manure on the incidence of blast and brown leaf spot   diseases in rice crop (RCM-9)

Decomposed cow dung manure level	Blast (%)	Brown leaf spot (%)
2.5 tons/ha	3.21c	11.02c
5 tons/ha	2.47c	9.42d
7.5 tons/ha	4.75b	12.94b
100-40-30KgNPK/ha	5.44a	16.46a
LSD	0.63	0.52

Means within columns followed by different letters are significantly different (P = 0.05)

Fig.1:- White ear head

Fig. 2:- yellow stem borer

Fig.3:- Dead heart
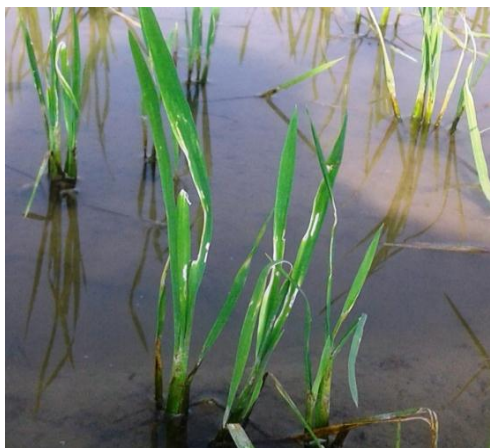

Fig. 4:- Yellow stem borer larva

Fig. 5:- Papery epidermis on rice leaf caused by case worm

Fig. 6:- Rice case worm (*Nymphuladepunctalis*)

Discussion:-

Luong*et al*., (2005) reported that the population of insect pests as stem borer, brown plant hopper and leaf folder on the chemical fertilizer treatment exhibited the severe outbreak more than in the treatments of chicken and hog manure compost and organic fertilizer application. According to Prasad *et al*. (2004), leaf folder (*Cnaphalocrocismedinalis*) and yellow stem borer (*Scirpophagaincertulas*) were greatest at 200 kg N·hm^{-2}and lowest at 0 kg N·hm^{-2}. They have also reported that the disease index of blast and sheath blight was reduced 50-60% and 90% respectively in the plots treated with chicken and hog manure compost as compared to the chemical fertilizer. The result revealed that green manure crop and decomposed cow dung manure were more effective than chemical fertilizer to induce tolerance to insect pests and diseases. Their effect exhibited through decreasing population and incidence of blast, brown spot, stem borer and as well as case worm of rice. Magdoff*et al.,(*2000) indicated that farming practices that cause nutrition imbalances can lower pest resistance. The interaction between manure compost, green manure crop and fertilizer was not significant. Similar results were also reported by Gattani*et al*., (1976). From the experiment, it can be concluded that most pest and disease control measures used by the farmers should be based on soil fertility management as the capacity of the plants to resist to insect pests and diseases strictly relates to optimal physical, chemical and mainly biological characteristics of the soil.

Acknowledgement:-

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