SYNOPSIS

Pre Dissertation

(AGR 591)

"Response of direct seeded rice to pre and post emergence herbicides"

Submitted To

Department of Agronomy

School of Agriculture

Lovely Professional University

Punjab (India) 144411

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UNDER GUIDANCE OF

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November 2017

CERTIFICATE

This is to certified that the synopsis entitled **Response of direct seeded rice to pre and post emergence herbicides** submitted in partial fulfillment of requirements for degree of Master of Science (M.Sc.) in Agronomy by **Bondada Sri Naga Sankara Gowtham Kumar** to Department of Agronomy School of Agriculture, Lovely Professional University, has been formulated and finalized by the student himself on the subject.

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DECLARATION

I hereby declare that the project work entitled **"Response of direct seeded rice to pre and post emergence herbicides"** is an authentic record of my work carried at **Lovely Professional University** as requirements of project work for the award of degree of Master of Science in Agronomy, under the guidance of **Dr. Mayur S. Darvhankar**, Assistant Professor, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India.

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INTRODUCTION

Description of Rice:

Rice (*Oryza sativa* L.) is one of the most important food crops in the world, and staple food for more than 50% of the global population. Centre of origin of cultivated rice is the part of South East Asia, which is considered as the heartland of rice cultivation.

Rice is not only a major staple food item but also a way of life for the millions in India. A crop of great antiquity with nearly 10,000 years of cultivation, being the major source of food after wheat, it meets 43 % of calorie requirement of more than two third of the Indian population.

Rice production in India was increased many fold from 35.0 million tonnes in 2002 to 103.61 million tonnes in 2016 with an area of 43.5 million hectares and productivity 2.4 tonnes /hectares due to development and cultivation of semi dwarf high yielding rice varieties in the early seventies. In Punjab, it occupied 2.89 million hectares with total production of 11.11 million tonnes and productivity of 3.8 tonnes /hectares during 2014-15. It shows Punjab has more productivity/hectares than national level even though state is facing the scarcity of irrigation water and deterioration of soil health.

This steady increase transformed the country into self-sufficient in food grains. However, rapid gains achieved in rice productivity during 70's and 80's could not be sustained since 90's. In India, current annual growth rate of rice production is 1.27% as against the population growth rate of 1.90%. Considering this, prediction of India's rice production target for 2025 is 140 million tonnes, which can be achieved only by increasing the rice production by over 2.0 million tonnes per year and productivity to 3.2 tonnes per hectare from the present level of 2.05 tonnes per hectare. This has to be done against the backdrop of diminishing natural resource bases like land, labour and water.

Direct-seeded rice (DSR)

DSR refers to the process of establishing a rice crop from seeds sown in the field rather than by transplanting seedlings from the nursery. Direct seeding rice, a common practice before green revolution in India, is becoming popular once again because of its potential to save water and labour. Currently, direct seeded rice in Asia occupies about 29 Million hectare which is

approximately 21% of the total rice area in the region. Countries like USA and Australia extensively practicing direct seeding of rice are with profitable results as it avoids all the penalties entailed in transplanting. Direct seeded rice under no/reduced tillage is an efficient resource conserving technology (RCT).

Direct seeding is can be done by sowing of pre-germinated seed into a puddled soil (wet seeding) or standing water (water seeding) or prepared seedbed (dry seeding). Improved short duration and high yielding varieties, nutrient and weed management techniques encouraged the farmers to shift from traditional system of transplanting to DSR culture

Labour required for nursery raising, uprooting and transplanting of seedlings are saved to the extent of about 40%. Saving of water (up to 60%) as nursery raising, puddling, seepage and percolation are eliminated. Fertilizer use efficiency is increased because of placement/ application of fertilizers in the root zone. Early maturity (7-10 days) helps in timely sowing of succeeding crops. Energy saving (up to 60% of diesel) because of elimination of field preparation for nursery raising, puddling and reduced water application for irrigation. Reduction in methane emission and global warming potential. Soil structure is not disturbed in direct seeded rice as occurs in puddled transplanted system. Less drudgery to farm women labours because of elimination of transplanting. System productivity is enhanced. Cost of cultivation is reduced by about ‘5000-6000 ha-1.

Weeds are great menace in DSR during rainy season and inadequate weed management led to severe loss in grain yield. In puddled transplanted rice, standing water does not allow weeds to emerge. In DSR, conditions are more favorable for the germination of weeds, which competes with rice for nutrients, moisture and sun light causing large yield losses. Generally, pre emergence herbicides are used in direct seeded rice which imparts only a partial control of weeds. Use of herbicides as a tank mix is expected to have a longer period of effective weed control. Hand weeding is easy and environment-friendly is tedious and highly labour intensive. Farmers very often fail to remove weeds due to unavailability of labour at peak periods. Moreover, morphological similarity between grassy weed and rice seedlings make hand weeding difficult at early stages of growth. Considering all these situations, herbicide is being considered as the most practical, effective and economical means of weed management in rice. Despite

some adverse environmental impacts, no viable alternative are presently available to shift the herbicide dependence of weed management in rice.

Weed management technology should consider not only for good yields but also consider the social and environmental aspects. The impact of recommended practice on environmental pollution, soil degradation, hazards to animals and effects on biodiversity. In post green revolution period there has been tremendous decline in number of weed species present in soil which flavoured undesirable shift in weed flora making weed control a difficult task weed management strategies should not be confined to manual or chemical weed control.

Keeping these points in view, an investigation will be conducted on Response of direct seeded rice to pre and post emergence herbicides with the following objectives.

1. To study the effects of herbicides on weed floral and weed control index in rice,
2. To study the effect of herbicides on growth and yield of rice crop
3. To work out the economics of herbicides in direct seeded rice.

REVIEW OF LITERATURE

In direct seeded rice conditions are more favorable for the germination of weeds, which competes for nutrients, moisture and sun light causing large yield losses. Hence early control of weeds is essential in direct seeded rice hence it may reduce the yield of the rice crop.

Keeping in view the objectives of the study, an attempt was made in this chapter to review the available literature which are directly or indirectly related to the study and are presented under the following sub-heads.

Hussain *et al.* (2007) stated that to manage the weeds in direct seeded rice, four weedicides were tested and compared their efficacy with handweeding. Among the weedicides Nominee 100SC (bispyribac sodium) and Sunstar Gold 60WG (Ethoxy sulfuron) proved as the best weedicides with 90.5 and 87.19% weed control respectively.

Singh *et al.* (2007) study was conducted to evaluate the effects of intercropping *Sesbania* with dry-seeded rice up to its vegetative phase (*Sesbania*), mulching with wheat residue (mulch) and herbicides for managing weeds and optimising the yield of dry-seeded rice. The density of grass weeds was lower with the mulch at all stages of crop growth. Though the dry weight of grass weeds at 30 days after seeding (DAS) was lower with *Sesbania* than with mulch, they were similar at later stages. A lower broadleaved weed density and dry weight were observed with *Sesbania* than with the mulch.

Walia *et al.* (2008) experiments were conducted during Kharif season of 2007 and 2008 at Punjab Agricultural University,Ludhiana to evolve suitable combination of pre and post-emergence herbicides for effective weed management in direct-seeded rice under unpuddled conditions. Results that integration of post-emergence application (30 Days after sowing) of bispyribac (25 and 30 g/ha) or azimsulfuron (20 g/ha) with pre-emergence application of pendimethalin 0.75 kg/ha, pretilachlor 0.5 kg/ha and thiobencarb 1.25 kg/ha provided effective control of weeds and produced significantly higher grain yields than unweeded (control) treatment.

Jannu, N., Srinivasa R. and Sunitha D. (2010) experiment was conducted on weed control in direct seeded rice under rainfed condition at college farm, college of agriculture,

Rajendranagar, Hyderabad, during kharif, The soil of the experimental site was sandy clay loam in texture with a pH of 7.8, low in available nitrogen, high in available phosphorus and medium in available potassium. The results revealed that early post-emergence application of Cyhalofop-buty + (chlorimuron-ethyl+ mestulfuron-methyl) @ 90+20 g ha-1 applied at 20-30 DAS resulted in lower weed density and weed dry matter production, thus gave higher weed control efficiency (82.13%).

Abdullah, M.D. and Mamun, A. L. (2010) conducted experiments to investigate rice-weed competition during direct-seeded rice cultivation. A rectangular hyperbolic equation was used to predict rice yield as a function of weed densities. The dry matter production and intraspecific competition of weeds were 1.13–3.63 g plant-1 and 0.0375–0.0383, respectively. The competition effect of weeds on rice was significant and the competitivity value ranged from 0.0170 to 0.0126. Therefore, the number of panicles m-2, grains panicle-1 and 1,000-grain weight were significantly reduced by the competition of weed species.

Pathak *et al.* (2011) observed that in direct seeded rice *Ischaemum rugosum, Echinochloa crus-galli, Echinochloa colona, Leptochloa chinensis,* and *Cyperus* spp are major dominant weed species.

Rohitash *et al.* (2013) a field experiment was carried out during the rainy season of 2013 at Choudhary charan singh Haryana Agricultural university, regional research station, karnal, stated that the different combinations of herbicides as alone and tank-mix to control the dynamic and complex weed flora in direct-seeded *basmati* rice (*Oryza sativa* L.) Bispyribac-Na was the most effective against grassy weed *Echinochloa crus-galli*, and pyrazosulfuron, azimsulfuron and ethoxysulfuron against broad-leaf weeds and sedges. Tank-mix application of fenoxaprop showed antagonistic effect on efficacy of bispyribac against weeds.

Verma *et al.* (2015) an experiment was conducted at the Research Farm of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu observed that the most efficient weed control was provided by the application of Pendimethalin @ 1.0 kg/ha (PE) *fb* Bispyrebac @ 0.030 kg/ha (PoE) that resulted in highest Weed Control Efficiencies of 84.01 and 86.05 % favouring highest grain yields of 23.69 and 25.09 q/ha of direct seeded basmati rice.

Tej, P., Rekha and Singh. M. (2016) a field experiment was carried out at GB pant university of agriculture and technology, pantnagar during kharif season of 2015 and 2015 and observed that *Echinochloa colona, Echinochloa crus-galli* and *Brachiaria ramosa among grasses, Celosia argentea, Trianthema monogyna, Amaranthus viridis, Cleome viscosa*, *Eclipta alba* and *Commelina benghalensis* among broad leaved weeds. *Cyperus iria, Cyperus difformis and Fimbristylis miliacea* in sedges were dominant weeds.

Raj, K.S and Elizabeth (2017) stated that weeds are the major biological constraint in direct seeded rice (DSR) due to the concurrent emergence of competitive weeds, absence of water to suppress weeds at the time of seedling emergence and emergence of difficult to control weeds. In order to achieve the long term and sustainable management of weeds in DSR an integration of different weed management strategies like integrated weed management (IWM) are essential.

MATERIAL AND METHODS

Technical programme

A. **Research topic:-"**Response of direct seeded rice to pre and post emergence herbicides".

B. **Location:** The experiment conducted on agriculture research farm, Lovely Professional University, Phagwara

C) Experimental details:

1. Year of experiment : 2018
2. Recommended dose of fertilizer : 150:50:50 kg N,P,K/hec
3. No. of treatments : 6
4. No. of replication : 3
5. Total no. of plots : 18
6. Plot size : 4.8m x 3m
7. Dates of sowing : April 2018
8. Experiment design : Randomized complete block design (RCBD)
9. Crop and variety : Rice Germplasm
10. Estimated area needed : 500m^2

D) Treatment details

T0	Control
T1	Butachlor
T2	Pretilachlor
T3	Chlorimuron + Metasulfuron methyl
T4	Bispyribse Sodium
T5	Cyhalofop Butyl+ Pyrazosulfuron
T6	Weedy Check
T7	HW + IC twice

Collection of sample:

Soil sample will be taken for analysis to check soil status (pH, N, P, EC and Organic carbon) of experimental field before crop season.

Analytical method to be followed during investigation are as under

S No.	**Test parameter**	**Method**	**References**
1	pH(1:2.5)	Glass electrode	Spark (1996)
2	EC(1:2.5)	Conductivity meter	Spark (1996)
3	Organic carbon	Wet digestion	Walkely and black (1934)
4	Available N	Alkaline potassium permagnate method	Subbiah and asija (1956)
5	Available P	Oslen' method	Oslen *et al*. (1954)
6	Available K	Flame photometer	Jackson (1973)

F) Observations to be recorded:

Observation will be recorded at 15, 30, 45 and 60 days.

1. Weed count
2. Dry weight of seed
3. Weed control Index
4. Weed Index
5. Weed Flora of the experimental field
6. Plant height
7. Leaf area per plant
8. Leaf Area Index
9. No. of tillers
10. 1000 grain weight
11. Grain yield
12. Straw yield
13. Economics of weed control

G) Statistical Analysis:

The data will be statistically analyzed by using ANOVA of randomized complete block design and Per-se information.

REFERENCES

Abdullah, M. D. and Mamun, A. L. (2010). Modelling Rice-Weed Competition in Direct-Seeded Rice Cultivation.

Hussain, S., Ramzan, M., Akhter M. and Aslam, M. (2007). Weed management in direct seeded rice.

Jannu, N., Srinivasa R. and Sunitha D. (2010). Effect of Diffferent Herbicides on Weed Growth and Grain Yield of Direct Seeded Rice under Rainfed Condition. *Int. J. Pure App. Biosci.* **5 (4):** 1122-1126.

Pathak, H; Tewari, S., Sankhyan, D. S. Dubey, U. Mina, Virender K., Singh, N. Jain and Bhatia, A. (2011). Direct-Seeded Rice: Potential, Performance And Problems – A Review

Pratap.T; Rekha; Singh Mahavir. (2017). Effect of propanil on control of complex weed flora in direct- seeded rice. *Journal of Hill Agriculture* **8**(2):191-194.

Rohitash, B., Bir Dharam, Punia S.S., Yadav Ashok. (2013). Efficacy of different herbicides against complex weed flora in direct-seeded *basmati* rice (*Oryza sativa*). *Indian J. Agronomy,* **61** (3):388-391.

Sheeja K.R and Elizabeth K.S. (2017). Weed management in direct seeded rice: A review

Singh, S., Ladha, J. L., Gupta R.K Lav Bhushan A.N.Rao; B.Sivaprasad;P.P.Singh.(2007) Evaluation of mulching, intercropping with *Sesbania* and herbicide use for weed management in dry-seeded rice (*Oryza sativa* L.). *Crop Protection* 26(4): 518-524.

Walia, U.S., Walia, S.S., Amandeep Singh Sidhu and Shelly Nayyar. (2008). Bioefficacy of pre- and post-emergence herbicides in direct-seeded rice in central Punjab.