the weeds like *Echinochloa crus-galli*. On the other hand, chemical weed control is reported to be effective, efficient and cheaper (Chaudhry 1968; Ahmad and Haque, 1981).

In Punjab the losses due to weeds are estimated to be from 20-63% depending upon type of weeds and degree of infestation (Majid *et al.* 1975). Carson (1979) reported that thiobencarb (Saturan-G) and propanil were consistently effective and safe for the control of weed in transplanted rice. Mukhopadhyay and De (1979), Shahi *et al.* (1979), Gill and Mehta (1981), Gidnavar and Shivannandaiah (1988) obtained increased yield of rice with the application of butachlor and thiobencorb after 4 days of transplanting. Rahim and Bashir (1989) observed that hand weeding twice was followed by mechanical weeding, Rilof EC, DMA-6, Saturn 10G, Avirosan 3.3G and check, respectively. Weed growth was significantly reduced by the use of herbicides and resulted in increased yield of 12-13% against the control (Malik *et al.* 1994).

So in order to enhance the paddy yield, there is a dire need of developing a package of weed management technology for ready transfer to the farming community. Recognizing the fact, the present investigations were undertaken to study the efficacy of different herbicides and to figure out the environment friendly, safe and economical method of weed control.

## Materials and Methods

The investigations on chemical and mechanical weed control measures were carried out on seven pre- and post-em herbicides in comparison with hand weeding and weedy check and were evaluated against the prevailing weed flora of rice crop during 1993 and 1994 at Agricultural Research Institute, D.I.Khan. Variety KS-282 was transplanted in a plot size of 6 x 3 $m^2$, replicated four times with nine treatments (Table 1) in RCB design. Thirty days old nursery was transplanted on well prepared soil during mid June of 1993 and 1994. The herbicides were applied before and after the emergence of weed flora according to their suggested mode of application. Knapsack sprayer fitted with a flood jet nozzle was used for spray. Basal dose of PK fertilizers was applied @ 120-100 kg $ha^{-1}$ at planting time, while N at 120 kg $ha^{-1}$ was applied in two split doses, first at tillering and the second at paniele initiation stage. Hand weeded plots were kept weed free throughout the crop life. All agronomic operations and plant protection measures were adopted equally in all the treatments. Data on weed density ($m^{-2}$) were recorded by randomly throwing 1 $m^2$ quadrate in each treatment. Data were also recorded on paddy yield per plot which were subsequently converted to kg $ha^{-1}$. The crop was harvested during month of November each year. The data for each trait were subjected to ANOVA and means were separated by using LSD.

**Table 1: Detail of treatments during 1993 and 1994**

| S.No. | Herbicides Trade Name | Common Name | Dose a.i kg ha |
|---|---|---|---|
| 1 | Machete EC (pre-em) | butachlor | 1 |
| 2 | Machete EN (pre-em) | butachlor | 2 |
| 3 | Rifit 50 EC (pre-em) | pretilachlor | 0.65 |
| 4 | Rilof 50 EC (pre-em) | piperophos | 2 |
| 5 | Argold 5 G (pre-em) | cinmethylin | 0.04 |
| 6 | Pillarsete 60EC (pre-em) | Not revealed | 1.2 |
| 7 | Basagran EC (post-em) | bentazon | 4 |
| 8 | Hand Weeding | - | - |
| 9 | Weedy Check | - | - |

**Table 2: Weed Density ($m^{-2}$) and Paddy Yield (kg $ha^{-1}$) during 1993 and 1994**

| S.No. | Herbicides Trade Name | 1993 | | 1994 | |
|---|---|---|---|---|---|
| | | Weed density | Paddy yield | Weed Density | Paddy yield |
| 1 | Machete EC (pre-em) | 24 cd[3] | 2765 bc | 13 b | 2083 bcd |
| 2 | Machete EN (pre-em) | 20 de | 2969 bc | 12 bc | 2292 bc |
| 3 | Rifit 50 EC (pre-em) | 29 c | 2552 bc | 12 bc | 2317 bc |
| 4 | Rilof 50 EC (pre-em) | 17 ef | 2917 bc | 12 bc | 2188 bcd |
| 5 | Argold 5 G (pre-em) | 36 b | 2240 c | 17 b | 1745 cd |
| 6 | Pillarsete 60EC (pre-em) | 28 c | 2656 bc | 16 b | 1953 bcd |
| 7 | Basagran EC (post-em) | 13 f | 3256 b | 11 bc | 2604 b |
| 8 | Hand Weeding | 6 g | 5260 a | 6 c | 3698 a |
| 9 | Weedy Check | 53 a | 990 d | 31 a | 1458 d |

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[3] Means sharing a letter in common in the respective category do not differ significantly by LSD test at P 0.05.

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# STUDIES ON HERBICIDAL EFFICACY AND SPECTRUM OF ACTIVITY OF DIFFERENT HERBICIDES IN TRANSPLANTED RICE

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**ABSTRACT**

*To evaluate the effect of different pre- and post emergence herbicides in paddy, experiments were conducted during 1993 and 1994 at Agricultural Research Institute D.I.Khan. Seven pre- and post-emergence herbicides in comparison with hand weeding and weedy check were evaluated. The results obtained during both the years revealed that weed control treatments educed the weed infestation and elevated the paddy yield. In 1993, hand weeding followed by Basagran EC (post-em) and Rilof EC (pre-em) were the most effective in reducing the weed infestation to a level of 6, 13 and 17 weed plants $m^{-2}$, respectively. The highest grain yield of 5260 and 3256 kg $ha^{-1}$ were recorded in hand weeded and Basagran EC (post-em) treated plots. During 1994, hand weeding, and Basagran EC (post-em) reduced the weed infestation to 6 and 11 plants by producing a paddy yield of 3698 and 2604 kg $ha^{-1}$.*

**Key words:** Rice *Oryza sativa* weed density herbicides efficacy chemical control herbicides.

## INTRODUCTION

Rice *(Oryza sativa* L.*)* is the staple food in enormous nations. In Pakistan, it follows wheat as a staple diet. Rice is grown on 10.5% area of the country. In 199-2000 rice was grown on area of 2.515 million ha in the country with a production of 5.156 million tons with a mean yield of 2.056 t $ha^{-1}$ (Anonymous, 2000). Whereas, >6 t $ha^{-1}$ paddy yield is realized in USA and the Peoples Republic of China (Anonymous, 1997). Weed competition, among other factors is the obstacle in bumper harvesting. Rice occupies significant position in the pre-dominantly agricultural economy of Pakistan. Besides being a number two food staple of the country's population, it is the major export commodity in agriculture sector contributing approximately 15% to the total foreign exchange earnings of the nation. Despite advances in rice production in the country, the average national yields are still low as compared to the most of the advanced countries. Weeds as we all know have all along been a major constraint in achieving the most cherished objective for sustainable development in crop productivity. The detrimental effects of weed infestation particularly in rice production represent a stark reality and need no further emphasis. Weeds compete with rice for light, nutrients, water and other growth requirements, which consequently reduce the yields. Losses due to weeds have been estimated at 10% of the rice crop in India (De Detta *et al.* 1971 and De Detta, 1980). Depending on crop variety and agro-climatic conditions, 9-63% losses have been reported in rice yield from weed competition in the Indian sub-continent (Ahmad *et al.* 1977, Bhargavi and Reddy 1990 and Zafar 1989). Zimdhal (1980) however reviewed that reduction in yield due to weed competition is usually sigmoidal rather than linear because very low weed densities do not usually result in yield reduction. Control of weeds by manual labour or mechanical means is a tedious, time consuming, expensive and labour intensive job, which is being further complicated with the crop mimicry of

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