Chapter-V

DISCUSSION

The present field study was made for two years during Kharif, 2000 and 2001 with the main objective of ascertaining the effect of crop establishment and various weed control practices. Attempt was also made to improve the agro-technique for increasing the productivity of Basmati rice. For this purpose, a field study was made with Pusha Basmati-1 in 21- treatments. The experiment results have been presented in IVth chapter pertaining to plant height, number of shoots/m^2, dry mater accumulation, number of days taken to panicle emergence, number of days taken to 50% flowering number of days taken to maturity, number of panicles/m^2, panicle length, number of grains/panicle, Grain weight panicle, 1000 grain weight, Grain and straw yield, harvest index, N-up-take grain and straw, different types of weed population, dry weight of weeds, N-up-take by weeds, root study and economics.

The crop establishment and various weed control practices were also evaluated on the basis of crop yield, gross and net income and benefit cost ratio. In the present chapter, the result and the discussion has been made in the light of the observation and scientific logic according to the objectives to see how for the objectives have been fulfilled?

A. Growth Studies:

Growth of rice plant can be measured vertically in terms of plant height, number of shoots/m^2 and dry matter production. Dry matter production is more importance, because all other vegetative characters contribute to it.

The growth characters viz. plant height, number of shoot/m^2 and dry matter production continued to increase with advancement to the age of the rice crop. However, various methods of rice planting bought about greater variation in these characters. Direct sowing of seeds in unpuddled soil recorded significantly lowest plant height (cm) at all the stages of growth. But maximum plant height were observed in the Basmati rice were transplanted in puddle soil. But maximum number of shoots/m^2 was observed only at 60^{th} days stage and plant dry matter increased significantly upto on maturity of crop. It might be due to basmati rice transplanted in puddled soil influenced growth parameters markedly. As the life advanced, weeds competed with crop plants more effectively and significantly decreased crop growth (number of shoots/m^2 and plant dry matter weight). **Radhamani *et al.* (1997)** and **Krishnaswamy** and **Balasubramanian (1997)** reported that weed competition was greater in direct seeding in unpuddled soil then the rice transplanted in puddled soil, because of the similarities in age and morphological characteristics of grassy weeds and rice seedlings, resulting in decreased growth parameters and yield

significantly though the number of shoots/m^2 and plant height increased rapidly upto 60 DAS/ DAT, the rate of increase showed down form 60^{th} day to maturity stage of crop growth and reduction in plant height and number of shoots/m^2 took place. The cession in increase in plant height and number of shoots/m^2 at later stage might be because of continued weed competition (cumulative effect). Transplanted rice either in puddled or unpuddled soil weight upto 60^{th} days stage and increased all attributes except plant height. The maximum increase in dry matter production was observed in transplanted basmati rice under puddled and unpuddled soil. The result have been well correlated by observation of **Bhol and Singh (1987)** who reported beneficial response of puddling and weed control practices which killed both the above ground and under grounded organs of weeds and provided weed free environment to rice crop to grow efficiently. It ultimately enhanced the grain yield. Higher dry mater production by rice crop may be attributed of higher production of green leaves with increased photosynthetic efficiency.

Weed Management practices showed profound effect on plant height, number of shoots/m^2 and plant dry matter of the rice crop in the present field investigation. All the weed management practices showed significant variation over weedy check from panicle emergence to maturity of the basmati rice in both the years. However, plant height, number of shoots/m^2 and dry matter in both the years significantly differ with each

weed management practices. Highest values of all growth parameters were observed with weed free followed by chemical weed control followed by hand weeding, Stale seed bed followed by hand weeding, Stale seed bed followed by chemical weed control and stale seed bed over chemical weed control and unweeded check. Differential response of weed management practices is understandable because of better weed control which allowed the rice crop, plant to utilize the moisture light, plant nutrients and space more efficiently resulting into better growth and development. Under high weed infestation (unweeded check) the rice crop plants were unable to express their genetic potential due to tough weed, competition for all inputs. In weed free condition higher values of almost all growth parameters were maintained through out period due to absence of competition from weeds. Herbicidal combination with hand weeding and integrated weed management practices of weed control were the next best treatments than weed free as in their cases relatively higher weed control efficiency was maintained during entire period of crop growth. **Singh (1991)** and **Behera** and **Jena (1997)** found higher growth parameters with manual weeding (weed free), herbicidal application and integrated practice of weed control practices.

B. Development Studies:

The development of basmati rice deals to number of days taken to panicle emergence, number of days taken to 50%

flowering and number of days taken to maturity of the rice crop. It is clear from the result table 4.4, 4.5 and 4.6 indicate that the basmati rice was transplanted in puddled soil significantly delayed the number of days taken to panicle emergence, number of days taken to 50% flowering and number of days taken to maturity prolonged the above parameters in both the years. It is prolonged the period due to the puddled soil was lowest weed population due the lowest weed population increased the availability of moisture, plant nutrients, light and more space to developed the rice plant and delayed the panicle emergence, 50% flowering and maturity of the rice crop in both the years of field investigation. The same results also reported by **Behara** and **Jena (1997).**

It is clear from the result table 4.4-4.6 clearly indicate that the weed free (No weeds) was prolonged the time taken to panicle emergence, number of days taken to 50% flowering and time taken to maturity. The weed free treatment was observed significantly more time taken to panicle emergence, 50% flowering and time taken to maturity in weed free (Manual) more time taken as above. It is possible due to the number of weeds/m^2 was lowest, in this region the rice plant was survival frequent to availability of sufficient moisture, plant nutrient, sunlight and sufficient space to basmati rice to grow the more time taken to maturity and others development activity of rice crop.

C. Harvest Studies:

In this present field investigation varying methods of rice planting and weed management practices bought about significant variation on yield attributing characters during both the years of field experimentation. Transplanted Basmati rice under puddled condition followed by transplanted rice under unpuddled soil significantly increased almost all classical yield components i.e. number of panicles/m^2, panicle length, Total number of grains/Panicle, grain weight per panicle and 1000, grain weight over direct seeding in unpuddled soil condition, cumulative effect of all the classical yield parameters under puddled transplanted Basmati rice ultimately reflected in higher grain production over rest of the planting methods of rice. Number of panicles per m^2 is largely governed by the methods of land preparation and planting methods of Basmati rice. Proper land preparation provided weed free conditions at transplanting and favourable soil conditions for the growth and transplanting and favourable soil conditions for the growth and development of the Basmati rice crop as experiment by **Rajendran** and **Loceraduraj (1998)** which support the findings of present field experimentation. the increase in all these parameters or yield attributes might have also occurred due to favourable effects of puddling on nutrient availability to rice crop plants since it decreases the redox potential of submerged soils with marked improvement in physiochemical effects, increasing the supply of nitrogen (especially ammonical form),

phosphorus, potassium, iron and silicon to rice plants **(Bhol** and **Singh, 1987)**. Soil puddling also increases the mineralization of organic matter and boosts up the efficiency of applied nitrogen. With application of fertilizers, the process of tissue differentiation (from somatic to reproductive), meristematic activity and development to panicle primodia formation might have been induced causing greater number of panicle bearing shoots/m^2. Greater availability of plant nutrients induced translation of photosyntheses from leaves via stem to sink site that is the grains. This resulted in increased number of filled grains per panicle, which on maturity become bolder with higher test weight. Other then puddling, unpuddled and direct seeding in unpuddled soil also improved the classical yield components and finally grain and straw yield. Provided complete weed free condition during critical of crop weed competition and allowed crop to grow well in comparison to remaining planting methods of Basmati rice. That might be the reason for recording more plant height at later stages as well as increased values of number of shoots/m^2. But reduction in yield attributes and yield in comparison to puddled transplanted Basmati rice might be due to excessive increased in number of shoots/m^2. The results are in conformity with the findings of **Jena *et al.* (1999)**, and **Saikia** and **Pathak (1993).** The findings on classical yield components emanating from the present field investigation presented in Table 4.7, 8, 9 and 10 can easily be accounted for in view of the fundamental

physiological processes. Further these findings are in agreement with results reported by **Singh** and **Singh (1996)**, **Moorthy (1992)** and **Krishnasamy** and **Balasurbamanian (1997)**

The rice crop grown in weed free condition recorded maximum number of panicles/m^2, Panicle length, total as number of grains/panicle, grain weight/panicle and 1000, grain weight, while these characters were drastically reduced in weedy check. Applying the chemical weed followed by hand weeding followed by stale seed bed followed by hand weeding, stale seed bed followed by chemical weed control performed better in comparison to all other weed control practices except weed free. The favourable effect of these treatments in understand able because of better weed control which allowed the rice plants to utilize the moisture, nutrients, sun light and space more efficiently resulting in to efficient growth and development of rice crop. Under weed free condition the highest value of these traits and grain yield was realized as the plants were able to express their maximum genetic potential because of absence of weed-crop completion. These results are adequately corroborated by earlier findings of **Dhiman** and **Nandal (1996** and **1998),** who found that integrated practice and combination of herbicidal treatments appeared as effective as weed free check in increasing the number of panicles/m^2, panicle length, total number of grains/panicle, grain weight per panicle and 1000, grain weight and grain and straw yield.

D. Uptake Studies:

Nitrogen removal by basmati rice was maximum with transplanting of basmati rice under puddled soil condition during both the years of field study. Puddling increased the availability of nutrients in the soil in general, which led to an increased removal of applied fertilizers by basmati plants. The same findings also supported by **Bhol** and **Singh, 1987**

The nitrogen uptake by grain and straw of basmati crop significantly increased under weed free treatment in both the years of field investigation. It was recorded maximum under weed free check followed by chemical weed control followed by hand weeding, stale seed bed followed by hand weeding and stale seed bed followed by chemical weed control over rest weed control practices. These findings resemble that of **Deka** and **Gogoi (1995)** and **Chander** and **Pandey (1997)** who observed that weed control treatments significantly increased the nutrient availability to basmati rice than the weedy check by decreasing the weed dry weight.

E. Weed Studies:

Altogether twenty weeds species belonging to nine families were found in the weedy check plots. Among the grasses *Cynodon dactylon*, *Echinochloa Lodonum* and *Echinochloa crusgalli* were predominate weeds followed by *Cyprus rotundus* and *Fimbristylis Miliaceae* in sedges group. *Commelina benghalensis* and *Corchorus acutangulus* were the most

dominant weeds one among the broad leaved weeds. In both years *Echinochloa* species density was exceptionally high compared due to continues rainfall in July and August months causing wetting of soil which might have increased the density of such weeds. Similar weed flora in rice field has also been reported by **Singh** and **Singh (1998)** in Varanasi condition and by **Singh** and **Mehta (1998)** at Bahraich (U.P.). Heavy investigation of *Echinochloa sp*. *Cyprus sp*. In rice crop has been reported by **Dhiman *et al.* (1998)**, **Pandey** and **Swarnkar (1997)** from Jagdalpur (M.P.).

A classification of the weeds in grasses, sedges and broad leaved groups showed opposite trend in sedges and broad leaved weed composition. Percent composition of sedges decreased and that the broad leaved weeds in decreased with advancement of growth phases. However, the percent composition of grasses remained more or less static and was lowest than sedges and broad leaved weeds in Ist year while in IInd year increased the grasses, broad leaved and sedges weeds.

The distribution of weed species in the present field study was variable in both the years (c.f. Table 4.73, 74) sedges, grasses and broad leaved weeds were more in number during the IInd year while the grassy, sedges and broad leaved weeds lower number in Ist year. Results are in conformity with findings of **Mati (1977)** and **Singh (1991)** who reported that vegetation correlate with meteorological conditions such as temperature, rainfall and humidity.

Perusal of data on grasses, broad leaved and sedges weeds (c.f. Table 4.69, 70, 71, 74, 74) revealed that the weed density was significantly more in direct seeded under unpuddled soil condition contrary to this, transplanted basmati rice under unpuddled direct seeding condition significantly reduced the weed density as compared to basmati rice in unpuddled rice direct seeding during both the years of field study. These results are in conformity with the findings of **Singh** and **Singh (1996)** who obtained increased weed densities and weed dry matter with direct seeding under unpuddled soil condition. The better performance of the rice was transplanted in puddled soil condition was also reported by **Moorthy (1992)**, **Jena *et al.* (1999)** and **Bhol** and **Singh (1987)** as puddling decreased percolation loss of water and favourable land submergence which had inhibitory effect on the growth and dry matter build up weeds.

Various weed control practices reduced the density of individual weeds groups viz. grasses, broad leaved and sedges weeds as compared to weedy check. Control of Cyprus sp. And *Echinochloa sp.* During initial stages was the main problem at the filed experimental site. Manual weeding (weed free) at fortnightly interval provided almost complete control of each kind of weeds through out rice and crop growth period, followed by weed free check, chemical weed control followed by hand weeding stale seed bed followed by hand weeding, over stale seed bed followed by chemical weed control over rest weed

control methods in basmati rice in both the years of field investigation. Sedges weeds on the other hand were better controlled by manual weeding only and this may be due to effective removal of the rhizomes. Which are instrumental in reemergence of the weeds. The results are akin to the findings of **Pandey *et al.* (1997)** that the deleterious effects of chemical weed control followed by hand weeding on weed growth can be ascribed to the broad spectrum weed control by this combination chemical weed control followed by hand weeding the density of weeds reduced significantly followed stale seed bed followed by hand weeding or stale weed bed followed by hand weeding. This might probably be due to the fact that earlier sowing of seeds in unpuddled soil condition provided better situation for weed growth than rice growth. **Sharma (1994)** reported similar results i.e., increased tillage operation, reduced the weed infestation and promoted growth of basmati rice plants in the early stages.

F. Weed Dry Matter:

The dry matter accumulation by weeds irrespective of treatments, continued to increase reaching maximum at flowering stage and after that slowed down. The general increased in total weed dry matter was due to higher dry matter accumulation with advancement in age and additional dry matter produced new weeds that appeared later in the growing season. Dry weight of weeds increased progressively when rice was sown directly under unpuddled soil condition in both the

years of filed study. As increase in tillage (Puddled) and rice was transplanted in unpuddled soil statistically decreased the dry matter accumulation by weeds as compared to the rice was transplanted in puddled soil condition. These results are in close conformity with the earlier findings of **Singh** and **Singh (1996)**. They observed that the efficient system in relation to better weed control was transplanted basmati rice followed unpuddled direct transplanting over direct seeding in unpuddled soil condition. Dry weight of weeds increased progressively when the Basmati rice was sown directly under unpuddled soil condition in both the years of field study. These results are in close conformity with the earlier findings of **Singh** and **Singh (1996)**. They observed that the efficient system in relation to better weed control was transplanted basmati rice in puddled soil condition followed by rice was transplanted in unpuddled soil over direct seeding in unpuddled soil condition.

Weed control practices significantly reduced the dry matter of weeds compared to weedy check. The weed free weed control practice was obviously most efficient in this respect through out the crop growth. At initial stage of rice crop growth the weed free treatment gave nil dry matter accumulation over chemical weed control followed by hand weeding, Stale seed bed followed by hand weeding and stale bed followed by hand weeding over rest weed control practices in both the years of field investigation. **Moorthy (1997)** and **Behera** and **Jena (1998)** also experienced similar trend and they opined that

there is higher efficacy of sequential application weed control practices as a result of increase in weed control spectrum, resulting in decreased weed dry matter accumulation in basmati rice crop.

G. Root Studies:

The root study deals with length of root, weight of root and volume of root of basmati rice. The planting methods of basmati rice were significantly influenced the root length, root weight and root volume (c.f. 4.85, 86, 87, 88, 89 and 90). The basmati rice was transplanted in puddle soil condition was observed significantly more root length, root weight and root volume followed by the rice was transplanted in unpuddled soil condition over directs seeding in unpuddled soil in both the years of field investigation. It is attributed due to the more pulbersing the soil and low weed investigation in puddle soil.

The weed control practices also significantly influenced the root length, root weight and volume of root in both the years. The weed free treatment of weed control practices was observed significantly more length of root, root weight and volume of root in both the years of field investigation (c.f. 4.85, 86, 87, 89 and 90). It is attributed due to the low weed intensity in weed free treatment followed by chemical weed control followed by hand weeding, stale seed bed followed by hand weeding, stale seed bed followed by chemical weed control over rest weed control practices.

H. Economics:

In modern agriculture practicability of any method of sowing transplanting of rice can be judgedon the basis of additional return over established one. The economics of various treatments generally workout the basis average yield obtained it was worked out year wise on the basis of yield obtained and cost of cultivation. The basmati rice was transplanted in puddled soil gave maximum gross income Rs.54882 and Rs.52156 in 2000 and 2001 respectively, but the rice was transplanted in unpuddled soil gave Rs.53079 and Rs.50757 in 2000 and 2001 and the direct seeding in unpuddled soil gave Rs.51680 and 49291 in 2000 and 2001 respectively. The gross income Rs./ha increased due to the increased the grain and straw yield in transplanted rice inpuddled soil in both the years of field investigation. Net return Rs./ha was calculated in the rice when transplanted in puddled soil Rs.22356 and Rs.19169 in 2000 and 2001 over the rice was transplanted in unpuddled soil and directed seeding in unpuddled soil respectively. The benefit cost ratio was obtained more in the direct seeding in unpuddled soil 1.69 and 1.58 in 2000 and 2001. It was more than rice was transplanted is puddled soil or unpuddled soil condition. It may be due the low cost of cultivation in direct seeding in unpuddled soil in both the years of field investigation.

Application of weed control practices the cost of cultivation calculated more in weed free as compared to weed

control practices. The gross income Rs.56822 and 54343 in 2000 and 2001 and weed free (control) obtained significantly lowest gross income Rs.43237 and 41391 in 2000 and 2001 respectively. It is increase due to the increase the grain and straw yield/ha. The chemical weed control practice was obtained significantly more net return Rs./ha in both the years of field investigation. It is increased due to the lowest cost of cultivation Rs./ha in both the years of field trial. Benefit cost ratio was observed significantly higher in chemical weed control practice in both the years of field investigation, while the lowest benefit cost ratio was observed in unweeded check in both the years.

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