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EFFECT OF INTENSITY OF TILLAGE AND WEED CONTROL ON YIELD OF WHEAT UNDER RAINFED CONDITIONS

K.L. BHAGAT, H. SINGH and K.C. SONI,
Regional Agriculture Research Station R. S. Pura (Jammu Kashmir)

ABSTRACT

Experiments with wheat WL 410 were conducted on sandy loam soil under rainfed conditions during Rabi 1979-1980 and 1980-1981, using varying number of ploughings in combination with weed control by weedicide and/or interculture. The average grain yield in case of minimum tillage + weed control by weedicide and interculture was better than that obtained by conventional tillage. About 73 per cent reduction in grain yield was observed in case of minimum tillage, when weeds were not controlled. Weed control by interculture was found to be better than the use of weedicide. Net return of Rs. 2035 ha⁻¹ in case of minimum tillage (POWIC) was 40 per cent higher than the conventional tillage.

KEYWORDS: Weed Control, Wheat, Weedicide, Economics.

In dry land tracts of Jammu, it is a common practice to have more preparatory tillage operations with a belief that these are conducive to vigorous and luxuriant growth of crops, leading to higher yields. Particularly in wheat, more ploughings are given to prepare a fine seed bed and to conserve soil moisture. It has been estimated that depending upon the crop to be grown, about 10 to 25 per cent expenditure is involved on tillage operations. Repeated ploughings some times delay the sowing because of loss of soil moisture. More ploughings on slopy lands also expose the soil to erosion hazards, resulting in the loss of top fertile soil. On the other hand minimum tillage maintains crop residues on the soil surface, and thus protects the ground against wind and water erosion (Vacumer and Bakermans 1973). Ciha (1982) did not observe any effect of minimum tillage on grain yield of barley when compared to conventional tillage. Green and Meculloch (1976) have indicated the other advantages of minimum tillage like convenient use of herbicides for weed control, avoidance of extra tillage operations at inconvenient time, saving of time and energy. However no information is available about the suitability of minimum or zero tillage practice in comparison to the conventional practice of intensive tillage in the rainfed tract of Jammu region. Therefore experiments were conducted to study the effect of intensity of preparatory tillage in combination with weed control practices involving weeding and post sowing interculture on wheat.

MATERIALS AND METHODS

An experiment was conducted at the experimental farm of Dryland Agriculture Research Station, Dhainsar (Jammu) during the *Rabi* season of 1979-1981 to study the effect of minimum tillage in combination with different weed control practices on the yield of wheat. Experimental soil was sandy loam in texture and low in available N (234 kg.ha⁻¹) and P (19 kg.ha⁻¹) and medium in K (178 kg.ha⁻¹) having a pH of 7.4. The following treatment combinations

were tested in a randomized block design with three replications.

Treatments

- T₁ Control - No tillage + No Weed control (P₀W₀IC₀)
- T₂ No tillage + Weed control by weedicide (P₀W)
- T₃ No tillage + Weed control by interculture (P₀IC)
- T₄ No tillage + Weed control by weedicide + interculture (P₀WIC)
- T₅ One ploughing + Weed control by weedicide (P₁W)
- T₆ Two ploughings + Weed control by weedicide (P₂W)
- T₇ One ploughings + Weed control by interculture (P₁IC)
- T₈ Two ploughings + Weed control by interculture (P₂IC)
- T₉ Conventional method - five ploughings + Weed control by interculture (P₅IC).

First ploughing (including treatment of one ploughing) was given by mould board plough and subsequent by country plough. Fertilizers to supply 60 kg N, 40 kg P₂O₅ and 20 kg K₂O ha⁻¹ respectively were drilled at the time of sowing. Wheat C.V.WL 410 was sown 25 cm apart in rows with a seed rate of 100 kg.ha⁻¹ on November 27 in 1979-1980 and on December 3 in 1980-1981. For chemical weed control, nitrofen @ 1.25 kg a.i. ha⁻¹ was applied just after sowing. Weed control by interculture involved hand hoeing with medium cultivator between 30th and 35th day after sowing. Air dry weight of weeds were recorded at two locations of 1 m² area from each plot.

RESULTS AND DISCUSSIONS

Grain Yield

The grain yield was slightly higher during 1980-1981 due to above normal rainfall (398.1 mm) as compared to *Rabi* 1979-1980 with 190.4 mm rainfall (Table.1). No ploughings

($P_0W_0IC_0$) resulted in maximum grain yield (21.09 q ha^{-1}), when weeds were controlled by weedicide along with interculture (Table 2). This suggested when weeds were controlled effectively no tillage did not decrease the grain yield. Similar observations were reported by Khan (1957), Meggit (1960) and Ciha (1982). However no ploughing in the presence of weeds ($P_0W_0IC_0$) resulted in significantly lower grain yield (12.13 q ha^{-1}) as compared with other tillage treatments of one, two and five ploughings. Reduction in grain yield was due to crop-weed competition for nutrient, water and solar radiation resulting in yield reduction in main crop. These results are in full accord with that of Vacumer and Bakermans (1973). Redney and Wesley (1974) also reported similar results. Conventional method did not differ among themselves in respect of grain yield in the presence of weed control by any means, which further substantiated the earlier observation that intensity of tillage in the presence of weed control did not affect the crop yields. Under rainfed conditions weed control as post planting interculture gave slightly higher grain yield than chemical weed control (Burside and Wicks, 1965).

Weed Control

Maximum weed growth was observed in control plots of no ploughing+ no weed control which was approximately double than the plots where no ploughing was combined with weed

control either by weedicide or interculture. Weed growth in this control plots were more than 265 per cent than where weeds were controlled both by weedicide and interculture (P_0WIC). Weeds were also significantly less where two or five ploughings were given as compared with one ploughing in the presence of weed control either by weedicide or interculture.

Economics

The economics of the treatmental practices included had been worked out with the prices of inputs and produce prevailed during the period of experimentation. Maximum return ($\text{Rs.}2035 \text{ ha}^{-1}$) was obtained in the treatments of no ploughing in the presence of effective weed control by both weedicide and interculture (P_0WIC) and one ploughing in combination with weed control by interculture P_1IC ($\text{Rs.}2034 \text{ ha}^{-1}$) followed by no ploughing or two ploughings in combinations with weed control by interculture (Table 2). No ploughing in the absence of any weed control gave minimum net return ($\text{Rs.}933 \text{ ha}^{-1}$) which was about 50 per cent less than that of above treatments. In the presence of weed control by interculture the total return in T_5 ploughing was comparable with one or two ploughings. The net return ($\text{Rs.}1445 \text{ ha}^{-1}$) was much lower in conventional method, because of increased cost of more number of ploughings.

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Tillage intensity & Weed control on rainfed wheat.

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TABLE 1. Rainfall received during the crop growth period (mm.)

Month	1979-1980		1980-1981	
	Rainfall	Raind days	Rainfall	Rainy days
October	Nil	2	25.3	2
November	15.6	2	32.4	2
December	5.4	2	21.5	4
January	80.4	7	150.0	12
February	36.5	3	54.7	8
March	41.7	8	99.2	10
April	19.8	1	15.0	4
Total	199.4	23	398.1	42

Table 2. Comparative economics of different tillage treatments

Treatments	Yield (q.ha ⁻¹)				Average total return (Rs ha ⁻¹)	Cost of cultivation (Rs ha ⁻¹)	Net return (Rs ha ⁻¹)	Income over control (T ¹)
	Grain		Straw					
	1979-1980	1980-1981	1979-1980	1980-1981				
T ₁ P ₀ W ₀ IC ₀	9.66	14.61	15.50	22.15	2069.00	1135.70	933.30	—
T ₂ P ₀ W	15.52	17.81	25.28	27.75	2862.30	1333.70	1528.60	595.30
T ₃ P ₀ IC	17.78	19.05	28.45	31.75	3190.27	1335.70	1854.57	921.27
T ₄ P ₀ WIC	20.78	21.41	30.65	32.45	3569.08	1533.70	2035.38	1102.08
T ₅ P ₁ W	17.78	20.49	24.80	33.75	3245.63	1485.70	1759.93	826.63
T ₆ P ₂ W	17.32	19.79	27.90	30.95	3183.48	1637.70	1545.78	612.48
T ₇ P ₁ C	21.24	20.90	25.15	36.45	3521.95	1487.70	2034.25	1100.95
T ₈ P ₂ IC	19.05	21.27	32.45	34.00	3502.54	1639.70	1862.84	929.54
T ₉ P ₃ IC	19.69	20.49	28.55	33.75	3421.09	1975.70	1445.39	512.09

Cost of

DAP = Rs. 341/q¹Urea = Rs. 241/q¹Mop = Rs. 126/q¹Wheat = Rs. 115/q¹ (1979-1980)Wheat = Rs. 117/q¹ (1980-1981)

Wheat Bhusa = Rs. 35/-q

Toke E-25 Rs.35/hr¹Bullock pair.8hr¹ = Rs. 30/-Labour 8hr¹ = Rs. 8/-Threshing with treactor hr¹ = Rs. 40/-