

## Effects of Stam F-34, Agroxone — 3 and Spontox with and without cultural practices on the control of rice weeds \*

by

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**Introduction:** Results of earlier investigations on application of weedicides on rice crop indicate that post-emergence application of a number of 2, 4-D and M. C. P. A. derivatives have effectively controlled non-grass weeds and increased yield when applied five to six weeks after transplanting (Ryker, 1947; Vachhani and Chavdhari, 1955; Bhardwaj and Varma, 1959; Vachhani *et. al.*, 1963; Sahu and Bhattacharya, 1964). However the dominant weed species infesting rice field in this region are mostly grasses. A newly introduced herbicide, Stam F-34 (3-4 dichloro-propionanilide) has been reported to offer a great promise of controlling both grasses and non-grasses, without injuring the rice crop (dewit, 1961; Van Rijn, 1963; Nair *et. al.*, 1964; Smith, 1965; Mukhopadhyay, 1965).

The present investigation was, therefore, planned to study the relative efficiency of different herbicide with and without interculturing in controlling the weeds associated with rice crop and their effects on the grain and straw yields.

**Material and Methods:** The present investigation was carried out at the Agricultural Research Institute, Sabour (Bihar) in a randomised block design with three replications and fifteen treatments on a uniform, deep, well-drained sandy loam soil of average fertility. The experimental plots received a basal application of single superphosphate at 45 kg P<sub>2</sub>O<sub>5</sub> per hectare. Urea was applied at 45 kg N per hectare in two equal instalments, viz., half at puddling and the remaining half 21 days after transplanting. A medium duration and high yielding variety of rice (B. R. 5) was transplanted on 25-7-1964. The net plot size was 6.70 meters × 3.04 meters (0.0020 hectares). The season was conducive for the growth of rice with a total natural precipitation of 670.9 mm spread over 57 days during the crop season which was about normal. The herbicides selected were Stam F-34@

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(3-4 dichloropropionanilide), Agroxone-3 (Sodium Salt of MCPA) and Spontox (combination of sodium salt of 2, 4-D and ester of 2, 4, 5-T). The treatments were as follows:

T <sub>1</sub>	Unweeded control
T <sub>2</sub>	Interculturing with Japanese weeder 3 weeks after transplanting
T <sub>3</sub>	Hand weeding 3 weeks after transplanting
T <sub>4</sub>	Stam F-34-3 weeks after transplanting (3.33 a. e. Kg/ha)
T <sub>5</sub>	" 4 " " (4.44 " " )
T <sub>6</sub>	" 5 " " (5.55 " " )
T <sub>7</sub>	Agroxone 3-3 " " (1.11 " " )
T <sub>8</sub>	" 4 " " (2.22 " " )
T <sub>9</sub>	" 5 " " (3.33 " " )
T <sub>10</sub>	Spontox 3 " " (1.11 " " )
T <sub>11</sub>	" 4 " " (2.22 " " )
T <sub>12</sub>	" 5 " " (3.33 " " )
T <sub>13</sub>	" 34-3 " " (3.33 " " )
	Interculturing with Japanese weeder 5 weeks after transplanting
T <sub>14</sub>	Agroxone-3-3 weeks after transplanting (1.11 a. e. Kg/ha) + Interculturing with Japanese weeder 5 weeks after transplanting
T <sub>15</sub>	Spontox-3 weeks after transplanting (1.11 a. e. Kg/ha) + Interculturing with Japanese weeder 5 weeks after transplanting.

The standing water in the experimental plots was completely drained out prior to herbicidal treatment and the plots were irrigated after 36 hours of treatment. Weed studies were made by erecting 0.609 meter x 609 meter quadrats, 3 times in each plot at 3, 4, 5, 6 and 8 weeks intervals after transplanting.

**Results and Discussion:** 1. *Weed flora and their herbicidal selectivity:* A survey of the weed flora revealed the presence of the following weed species and their reaction to the different herbicidal treatments:

(i) Moderately resistant: *Cynodon dactylon* pers. (Dub) *Eragrostis enterrupta*, *Dichanthium annulatum* staff. (padhar).

(ii) Susceptible: *Ammannia baccifera* L. (Dadmari) *Celosia argentea* L. (Safed murgha), *Commelina benghalensis* L. (Kanchara) *Corchorus acutangulus* Lamk. (Jangli Jute), *Cyperus amabilis* Vahl.

(Motha) *Cyperus iria* L. (Motha), *Cyperus rotunds* L. (Motha) *Echinochloa crusgalli* Beav. (Sawank), *Eclipta alba* Hassk. (Bhangraiya), *Eleusine indica* Gaerton. (Kodai) *Euphorbia hirta* L. (Baridudhi), *Ischaemum rogusum* Salisb. (Moraro), *Justicia quinqueangularis* Koen. (Darhua), *Polygonum plebejum*.

2. *Weed population studies*: The data on the population of weeds recorded at different stages of plant growth have been summarised in Table 1.

TABLE 1. Effect of treatments on weeds (Average of 3 quardats)

Treat- ments	Weeks after Spraying															Density	Morta- lity percent
	Third Initial			Fourth			Fifth			Sixth			(Final)				
	M	D	T	M	D	T	M	D	T	M	D	T	M	D	T		
T <sub>1</sub>	107	3	110	123	4	127	131	4	135	152	7	159	176	11	187	13.64	.....
T <sub>2</sub>	92	5	97	7	2	9	9	4	13	11	5	16	9	5	14	3.78	85.56
T <sub>3</sub>	105	8	113	15	2	17	12	6	25	19	6	25	21	6	27	5.20	76.10
T <sub>4</sub>	93	6	99	...	...	...	...	...	...	3	1	4	3	1	4	2.11	95.96
T <sub>5</sub>	117	7	124	128	8	136	2	2	4	3	2	5	4	3	7	2.72	94.85
T <sub>6</sub>	128	9	137	138	11	149	141	12	153	5	3	8	8	1	9	3.49	94.12
T <sub>7</sub>	89	2	91	10	2	12	9	1	10	8	...	8	7	...	7	2.68	92.31
T <sub>8</sub>	109	11	120	121	15	136	6	2	8	6	1	7	5	...	5	2.30	96.13
T <sub>9</sub>	99	6	105	106	8	114	114	9	123	11	2	13	11	1	12	2.51	90.24
T <sub>10</sub>	108	9	117	7	2	9	6	2	8	5	1	6	4	...	4	2.11	96.58
T <sub>11</sub>	89	7	96	119	8	127	10	3	13	6	...	6	5	...	5	2.32	96.06
T <sub>12</sub>	94	2	96	103	4	107	113	5	118	3	1	4	2	1	3	1.86	97.45
T <sub>13</sub>	112	11	123	...	1	1	1	2	3	...	...	...	2	1	3	1.86	97.56
T <sub>14</sub>	91	3	94	9	1	10	3	...	3	2	...	2	2	...	2	1.56	97.87
T <sub>15</sub>	103	6	109	5	...	5	4	...	4	2	...	2	2	...	2	1.56	98.16

S. Em M—Monocot D—Dicot, T—Total ± 0.31  
 F. test Sig.  
 C. D. at 5 percent 0.90

Monocotyledonous weeds were dominant in the rice field treatment and the control (T<sub>1</sub>) gave significantly higher weed population. The hand weeding at 3 weeks interval (T<sub>3</sub>), however, reduced the weeds significantly but the reductions in the case of interculturing at 3 weeks (T<sub>2</sub>), Stam F-34 (T<sub>6</sub>) and Agrozone-3 (T<sub>9</sub>) applied at 5 weeks are at a par and significantly lower than hand weeding (T<sub>3</sub>). Again these herbicides applied at early stages of crop growth (T<sub>4</sub>, T<sub>5</sub>, T<sub>7</sub> and T<sub>8</sub>) and Spontox at different intervals (T<sub>10</sub>, T<sub>11</sub> and T<sub>12</sub>) reduced the weeds markedly. However, when these were supplemented by interculturing at 5 weeks (T<sub>13</sub>, T<sub>14</sub> and T<sub>15</sub>), significantly lowest weeds were observed.

3. *Yields studies:* The data on grain and straw yields of rice under different treatments have been summarised in Table 2.

TABLE 2. Mean grain and straw yields of rice under different treatments in quintal/hectare and Comparative economics of different treatments.

Treatments	Yield (Q/ha)		Increase in yield over control (Q/ha)		Total value Rs.	Cost of herbicides + spraying Rs.	Cost of Cultural operation Rs.	Operation * cost on extra produce of grain over control Rs.	Total cost of treatments Rs.	Net profit or loss over control Rs.
	grain	straw	grain	straw						
1	2	3	4	5	6	7	8	9	10	11
T <sub>1</sub>	10.38	41.51	...	...	...	...	...	...	...	...
T <sub>2</sub>	18.78	80.05	8.40	38.54	629.50	...	6.25	43.68	49.93	+579.57
T <sub>3</sub>	14.33	60.78	3.95	19.27	301.75	...	16.25	20.54	36.76	+264.96
T <sub>4</sub>	20.26	93.39	9.88	51.88	773.16	165.68	...	51.37	217.05	+556.11
T <sub>5</sub>	17.79	66.71	7.41	25.20	511.32	218.29	...	38.53	256.82	+254.50
T <sub>6</sub>	14.33	48.92	3.95	7.41	242.45	270.90	...	20.54	291.44	-48.99
T <sub>7</sub>	17.79	74.61	7.41	33.10	550.89	35.69	...	38.53	74.22	+476.60
T <sub>8</sub>	18.78	60.78	8.40	19.27	533.15	63.68	...	43.68	107.36	+425.79
T <sub>9</sub>	14.33	43.98	3.95	2.47	217.75	92.07	...	20.54	112.61	+105.14
T <sub>10</sub>	16.80	47.44	6.42	5.93	363.49	53.66	...	33.58	87.04	+276.45
T <sub>11</sub>	13.34	41.51	2.96	...	153.92	99.82	...	15.39	115.21	+38.71
T <sub>12</sub>	13.84	42.99	3.46	1.48	187.32	145.99	...	17.99	163.97	+23.35
T <sub>13</sub>	23.73	107.23	13.34	65.72	1022.28	165.18	6.25	69.36	240.79	+781.49
T <sub>14</sub>	20.75	80.05	10.37	38.54	731.94	35.69	6.25	53.92	95.86	+636.08
T <sub>15</sub>	17.79	57.32	7.41	15.81	464.37	53.66	6.25	38.53	98.44	+365.93

S. Em 1.04 4.69

Sig. at 5 percent Yes Yes

C. D. 3.01 13.59

- A. A value of paddy grain and straw @ Rs. 52.00 and Rs. 5.00 per quintal, respectively.  
 B. Cost of Stam F-34 (36 percent a. e.), Agroxone-3 (27.5 percent a. e.) and Spontox (69.29 percent a. e.) at Rs. 17.25, Rs. 6.63 and Rs. 28.85 per litre, respectively.  
 C. Cost of spraying at Rs. 7.50 per spraying/hectare (6 men @ Rs. 1.25 per day).  
 D. Cost of hand weeding at Rs. 16.25 per hectare (13 men at Rs. 1.25 per day).  
 E. Cost of interculturing with Japanese weeder at Rs. 6.25 per hectare (5 men at Rs. 1.25 per day).  
 \* Processing cost on extra-produce of grain over control @ Rs. 10/- per quintal.

All the treatments except spontox at 4 weeks (T<sub>11</sub>) gave significantly higher grain yields than control (T<sub>1</sub>). Further, application of Stam F-34 at 3 weeks (T<sub>4</sub>) gave the highest grain yield among the herbicidal treatments (T<sub>4</sub>..... T<sub>13</sub>). However, supplementing this treatment (T<sub>4</sub>) with interculturing at 5 weeks (T<sub>13</sub>) increased the yield significantly by 33 percent. It can thus be inferred that Stam F-34 is a very promising

weedicide as it killed all grasses, broad-leaved weeds and severely damaged *Cyperus Sp.* without any injury to rice plants when applied at early stages of crop growth whereas higher rates of its application at later stages of crop growth ( $T_8, T_9$ ) indicated that it was not effective to kill older grasses and has a consequence weeds competed with the crop and thus depressed the yield as against its lower rate of application ( $T_1$ ) at early stages of crop growth (Mukhopadhyay, 1965). Similarly, Agroxone-3 was ineffective to kill older weeds even at higher dose at later period of crop growth ( $T_9$ ) which gave lower yield over its earlier application at lower doses ( $T_8, T_9$ ). Lower yield under treatments  $T_{11}$  and  $T_{12}$  (Spontox at 2.22 and 3.33 a. e. kg/ha at 4 and 5 weeks respectively) was perhaps due to their visible deliterious effects on crop which induced abnormalities in rice plants (Vein Chlorosis, inward rolling of leaf margins and stunted growth) and thus temporarily halted the growth activities. It was more pronounced with higher rate than its lower rate of application. Van overbreak (1947) observed that the application of 2, 4-D to a plant may cause excessive energy release that could affect the behaviour of plant or even stop its growth. Under the present trial, combination of sodium salt of 2, 4-D and ester of 2, 4, 5-T (spontox) has affected the behaviour of the plant. Interculturing (T 2) gave significantly higher yield than hand weeding (T 3) because of its comparatively higher efficacy to kill most of the weeds whereas the weeds regenerated in handweeded plots during later stages of crop growth competed with the crop and thus depressed yield.

Similar results were obtained for straw yield.

*Economics* : The relative efficiency of different treatments in respect of monetary return has been summarised in Table 2.

Among the various means of weed control ( $T_2$  .....  $T_{15}$ ),  $T_{15}$  (Stam F-34 at 3.33 a. e. kg/ha at 3 weeks supplemented with one interculturing at 5 weeks) gave maximum net profit of Rs. 781.49 per hectare over control ( $T_1$ ). Further, treatment  $T_2$  (interculturing with Japanese weeder at 3 weeks) gave a profit of Rs. 579.57 which is about 12 percent more than that obtained for  $T_3$  (Hand weeding at 3 weeks). However, treatment  $T_2$  compared favourably with the herbicidal treatment  $T_4$  (Stam F-34 at 3.33 a. e. Kg/ha at 5 weeks) add gave almost the same profit.

*Summary* : An investigation to find out an effective method of weed control in transplanted rice was conducted at the Agricultural Research Institute, Sabour (Bihar). The two most popular selective herbicides viz ; Agroxone-3 (Sodium-salt M. C. P. A. A.) and Spontox (Sodium-salt 2, 4-D) and ester 2, 4, 5-T together with a newly introduced herbicide Stam F-34

(3-4 dichloropropionanilide) were taken for comparison and were applied at varying doses and at different stages of growth of rice with and without interculturing with Japanese weeder.

Significant reduction in weed populations was obtained when Stam F-34 was applied @ 3.33 a. c. kg/ha at 3 weeks and supplemented with one interculturing at 5 weeks (mortality 96.58 percent). This treatment gave the maximum yields of grains and straw per hectare and also proved economically most profitable.

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