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Pyrethrum cultivation at Nanjanad

By

K. HANUMANTHA RAO, B. Sc. (Ag.)
Superintendent, Agricultural Research Station, Nanjanad

Introduction: Pyrethrum (*Chrysanthemum cinerarifolium*) belonging to the family *Compositae* is a glaucous perennial 18′ to 24″ high. The stems are unbranched and slightly hairy. The leaves are petioled and finely cut. The insecticidal property of this plant is known as "Pyrethrin", which is obtained mainly from its flowers the stamens and pistils, having insecticidal principle, in its most concentrated form. The original home of the plant seems to be in Persia. During the early part of the 19th century, Europe used to import both the plant itself and flower powder from Persia to meet a widespread demand for an effective vermifuge. Later on, in about 1850—60 a new species of the plant was produced in Dalmatia which gradually proved to be superior in quality to the Persian stuff. Long after this period the plant found its way to other places like Japan, Kenya etc.,. In pre-war period Japan used to produce 25 million pounds of dried pyrethrum flowers per annum and 90% of the output went to the United States. Since Japan started hostilities, the only supply for the allied countries has been from Kenya where pyrethrum is regarded as one of the most flourishing industries. Hence efforts were made to increase the area under this crop. From the year 1937 the Imperial (now Indian) Council of Agricultural Research seriously considered the introduction of pyrethrum into India and after a number of experiments found that places like the Punjab, Shillong in Assam, Kashmir and in certain parts of the Madras Presidency namely Nilgiris and Kodaikanal were suitable for its cultivation. During the World War II the area under this crop increased extensively to supply dried flowers to the military.

Cultivation: The plants can be propagated either from seedlings raised from seeds or from slips obtained from old plants. Three pounds of seeds sown over three cents of well prepared seed bed area give enough seedlings to plant one acre of land. The seeds are soaked in water for 24 hours before sowing and the seed beds are mulched after sowing and watered daily. Seeds take 10–21 days to germinate and the seedlings are ready for transplanting in four months. The field to be planted is given two deep ploughings. Ridges and furrows are formed 2′ apart along contour. The seedlings are planted on the ridges 1½′ apart in the months of June and July. One or two weedings are given as and when necessary. The plants begin to flower in about 10 months after planting and the flowering continues from May—July. There is also a second flush in October and November. When two whorls of disc florets open, the flowers are harvested without stalks and dried under shade. The correct stage of drying is reached within 8–10 days

when a flower squeezed between the finger and thumb, does not break. An average yield of 125 lb. of dried flowers per acre may be expected. Though pyrethrum is a perennial crop, it was observed that there was mortality in plants after the third year and therefore the maintenance of the plantation requires periodic filling up of gaps with fresh seedlings. A few experiments both cultural and manurial laid out at the Agricultural Research Station, Nanjanad to study the optimum conditions necessary for the maximum production of pyrethrum flowers are reviewed below:

(1) *Method of propagation:* A considerable diversity of opinion exists on the merits of propagation through (1) seed and (2) slips obtained from old plants. With a view to find out the relative merits of these two systems, an experiment was laid out with seedlings vs. slips in A B B A replications (Table I). The results of the trials indicate that seedlings are significantly better than slips even though slips flowered earlier by six months.

(2) *Spacing:* Different spacing are adopted between rows and in the rows in different countries. A considerable amount of experimental work has been carried out in other countries on the correct spacing to be adopted. An experiment was therefore laid out in 1944 to determine the optimum spacing to be adopted. The results are given to Table II. Though the treatments have not given any significant increased yields, there are indications to show that a spacing of 2′ between rows and 1½′ in the row is the optimum that could be adopted. This spacing facilitates intercultivation by bullock power.

(3) *Effect of pruning:* At the end of the flowering seasons the plants have a number of dead stems and in many countries these are generally cut back before the onset of the next growing season. Experiments were therefore laid out to study the effect of different methods of pruning in different seasons on the yield of flowers and the results obtained are furnished in Table III. Though there was no significance between treatments, yet root pruning done in May before the onset of monsoon recorded the highest yield of flowers and where the plants were cut to ground level gave the lowest yield. This is in general agreement with results obtained in Kenya.

(4) *Effect of manuring on flower production and pyrethrin content:* The yield of flowers and the pyrethrin content of flowers are very important in the economics of pyrethrum cultivation. The pyrethrin content varies greatly. Dalmatian flowers contain 0·7% to 0·9%, Japanese flowers contain 0·9% to 1·1% and Kenya flowers contain 1·3% to 1·4%. Since pyrethrin content of the pyrethrum flowers varies from locality to locality the factors responsible for this difference had to be investigated. One factor that might be responsible for increase in pyrethrin content and

also for increased flower production is the application of manure. With this view manurial experiments were conducted in different countries. In Colorado experimental station manurial experiments were conducted during 1932—33 with ammonium sulphate, super phosphate and potassium chloride. These three ingredients were tried in different combinations. None of these treatments had any significant effect in increasing the pyrethrin content. Ripert reports that in favourable years fertilizers increase the yield of flowers but in poor years maintains satisfactory yields. Fertilizers do not affect the pyrethrin content. Martin and Tetterfield came to the same conclusion after experimenting with potted plants treated with different manurial ingredients. Culbertson found that pyrethrin content is not influenced by fertilizer treatment. It is also said that excessive nitrogenous manure will result in excessive vegetative growth with no flowers. In Rhodesia ammonium sulphate seemed to increase the yield of flowers considerably. In Japan fish scrap is used as a fertilizer. In order to find out the effect of manures on the yield and pyrethrin content of flowers two experiments were laid out namely phosphatic trials and prawn dust trials. The treatments and results are furnished in Tables IV and V respectively. From the results it is seen that manuring does not increase the yield of flowers appreciably and this is in general agreement with other workers. Pyrethrum does not respond to manuring. This may be due to the fact that pyrethrum crop does not remove heavy quantities of plant foods. A 1000 lb. crop of dried flowers removes 17 lb. nitrogen, $25\frac{3}{4}$ lb. of potash and $5\frac{3}{4}$ lb. of phosphoric acid and $4\frac{1}{4}$ lb. of lime. Regarding the pyrethrin content a dressing of super phosphate and bonemeal to snpply 50 lb. of $P_2 O_5$ per acre in equal quantities has given the maximum.

Summary and Conclusions: A few experiments conducted to find out the correct spacing to be adopted, the effect of pruning plants and roots at different periods, the best method of propagation and the effect of the application of manures like prawn dust, super phosphate and bonemeal gave the following indications:

(1) That spacing of 2' between rows and $1\frac{1}{2}$' in the row was the optimum to be adopted.

(2) That root pruning done in May increased the yield of flowers.

(3) That propagation by seedlings was significantly better than by slips.

(4) That application of $\frac{1}{2}$ ton of prawn dust and 1 ton of lime has beneficial effect.

(5) That there was no response due to the application of phosphatic manures like super phosphate and bonemeal. Analysis of pyrethrum flowers produced at Nanjanad showed a very high content of pyrethrin as compared with foreign samples.

Literature Cited:

1. Arnold, H. C. — Pyrethrum—Tropical Agriculturist Vol. 100, 1944 p.p. 34–41.
2. Drain, B. D., Simanton, W. A. and Miller, A. C. — studies on clonal strains of pyrethrum — Proc. Amer. soc. Hort. Sci.
3. Erams, E. L. and Oradinger, C. B. and Coral, C. S. — Pyrethrum plant investigations in Colorado III — effect of spacing interval in the row on yield of flowers. — Procs. of the Amer. Soc. Hort. — Vol. 33, 1935 pp. 205–206.
4. Low, T. R. and Capt. Burn, J. G. — Pyrethrum cultivation in Kumdun (U. P.) Ind. Farming — Vol. VII: No. 2, 1946.
5. Majumdar, D. P. — Pyrethrum — its utility and possibilities — Allahabad Farmer — Vol. 16, 1942.
6. Martin, J. T.; Mann, H. H. and Tattersfield, F. — The manurial requirements of pyrethrum Ann. Appl. Biol. — 1939, 26: 14–24.
7. Ogden, H. P. and Drain Brooks, D. — Tennessey Agri. Expt. Stan. Rpt. — 1931 — 1932.
8. Puntambekar, S. V. — Pyrethrin content of Indian Pyrethrum — The Indian Forester — Vol. 70, 1944 page. 74.

TABLE—I. Yield of Fresh Flowers in lb. per acre.

S. No,	Treatments	1st year 1944—45	2nd year 1945—46	3rd year 1246—47	4th year 1947—48
1.	Seedlings A (control)	71·4	7163·0	376·0	86·0
2.	Slips B	54·0	899·2	178·0	28·0
3.	Mean	62·7	1031·1	276·0	57·0
4.	Standard error	...	0·57	0·8	0·29
5.	Critical difference	...	1·2	85 lb. per acre	30 lb. per acre
6.	Whether significant by 'Z' test ...		Yes	Yes	Yes

TABLE—II. Yields of Fresh Flowers in lb. per acre.

1.	2½'	between rows and 2½' in the row		A.	18·0	498·2	1088·0	172·0
2.	2½'	,,	2'	B.	14·1	555·0	1220·0	215·0
3.	2½'	,,	1½'	C.	18·0	591·14	1213·0	107·0
4.	2½'	,,	1'	D.	17·2	551·4	1238·0	209·0
5.	2'	,,	2½'	E.	14·8	525·15	1116·0	194·0
6.	2'	,,	2'	F.	19·5	627·8	1227·0	209·0
7.	2'	,,	1½'	G.	24·2	675·5	1379·0	238·0
8.	2'	,,	1'	H.	17·2	690·0	1352·0	224·0
9.	1½'	,,	2½'	I.	23·4	577·8	1103·0	167·0
10.	1½'	,,	2'	J.	14·1	615·15	1224·0	233·0
11.	1½'	,,	1½'	K.	21·9	570·10	1213·0	206·0
12.	1½'	,,	1'	L.	22·7	680·1	1288·0	281·0
13.	Mean				18·78	596·45	1222·0	212·0
14.	Standard error					21·5	16	12·04
15.	Critical difference					44	38	307 lbs. per acre.
16.	Whether significant by 'Z' test				only two were done.	No	No	No.

TABLE III. Yields of Fresh Flowers in lb. per acre

S. No.	Treatments	1st year 1944—45	2nd year 1945—46	3rd year 1946—47	4th year 1947—1948
1.	A Plants left unpruned	...	217·0	1407·0	300·0
2.	B Root pruning alone	...	235·0	1534·0	312·0
3.	C Plants pruned to half their size	...	155·0	1076·0	253·0
4.	D Plants pruned to ground level	...	122·0	963·0	257·0
5.	E Same as A	...	155·0	951·0	148·0
6.	F ,, B	...	160·0	1039·0	230·0
7.	G ,, C	...	148·0	935·0	207·0
8.	H ,, D	...	108·0	795·0	180·0
9.	I ,, A	...	200·0	1277·0	277·0
10.	J ,, B	...	183·0	1179·0	224·0
11.	K ,, C	...	175·0	1097·0	232·0
12.	L ,, D	...	143·0	1019·0	289·0
13.	M ,, A	...	179·0	1148·0	212·0
14.	N ,, B	...	205·0	1296·0	270·0
15.	O ,, C	...	125·0	924·0	244·0
16.	P ,, D	...	107·0	895·0	243·0
17.	Mean	...	not analysed statistically	1096·0	242·0
18.	Standard error	...	...	10·6	23·04
19.	Critical difference	...		21·7	582 lb. per acre.
20.	Whether significant by 'Z' test	...		No.	No.

TABLE IV. Phosphatic Trials

S. No.	Treatments		Yields of fresh flowers in lbs. per acre				
			1st year	2nd year	3rd year	4th year	pyrethrum content
1.	No manure control	A	109·5	2237·1	649	285	1·5475
2.	Super phosphate to supply 50 lb. of P_2O_5 per acre	B	75·0	979·1	404	197	1·7375
3.	Bone meal to supply 50 lb. of P_2O_5 per acre	C	49·2	983·9	481	237	1·875
4.	Super phosphate to supply 25 lb. of P_2O_5 per acre plus bonameal to supply 25 lb. of P_2O_5 per acre	D	68·0	885·8	421	183	2·2375
5.	Super phosphate to supply 100 lb. of P_2O_5 per acre	E	60·7	916·4	378	157	1·6495
6.	Bonemeal to supply 100 lb. of P_2O_5 per acre	F	74·6	1110·6	576	238	1·8815

S. No.	Treatments		Yields of fresh flowers in lb. per acre				
			1st year	2nd year	3rd year	4th year	Pyrethrum content
7.	Super phosphate to supply 50 lb. of P_2O_5 per acre plus bone-meal to supply 50 lb. P_2O_5 per acre	G	71·5	119·8	555	253	1·28
8.	Mean		72·6	1018·1	495	221	
9.	Standard error			0·1	10	12·1	
10.	Critical difference			0·21	21	320 lb. per acre.	
11.	Whether significant by 'Z' test.			No	No	No	

TABLE—V. Prawn Dust Experiment

S. No.	Treatments		Yields of fresh flowers in lb. per acre.				
			1st year 1943—44	2nd year 1944—45	3rd year 1945—46	4th year 1946—47	5th year 1947—48
1.	No manure	A.	337·88	273·6	33·0	449·25	438
2.	Prawn dust @ ½ ton per acre	B.	329·13	336·6	39·75	475·50	448
3.	Prawn dust @ ½ ton per acre plus 1 ton lime per acre	C.	308·50	459·4	32·25	518·5	509
4.	Mean		325·17	356·5	35·0	481·0	415
5.	Standard error		19·44	17·5	...	4·2	4·086
6.	Critical difference		27·49	42·97	...	9·4	114 lb. per acre.
7.	Whether significant by 'Z' test		No	No	...	No	No

Pedigree seed of rice—its rapid extension in the country

By

M. B. VENKATANARASINGA RAO, B. A., B. Sc. (Ag.), A. I. A. R. I.
Paddy Specialist, Agricultural College and
Research Institute, Coimbatore.

Temporary increase in production could be obtained by crop management but as a long-term policy, efficiency of production must be increased by breeding. For, in the management of crop, the question of cost comes in, and a certain treatment ceases to have value if it is uneconomical. That the use of seed, improved by breeding, is a sure and cheap way of augmenting seed supply is an indisputable point. It has been found that pedigree seed is able to give increased yield anywhere from 10 to 30 per cent depending upon the variety. It has also been