and seedling growth of *Amaranthus leucocarpus* Wats and barnyard grass owing to phytotoxic mixture of resin glucosides (Anaya *et al*. 1990).

Efficiency of weed control treatments ranged from 17.26 to 82.26 per cent of 20 DAS. The highest WCE (82.26 per cent) was recorded with the pre-emergence application of fluchloralin + one hand weeding followed by mulching of *Eucalyptus* leaf litter (62.01 per cent) and mulching of sweet potato fresh vine residue (53.14 per cent). The lowest weed control efficiency was registered under mulching of maize stover residues (71.26 per cent). Similar trend was also observed at 40 DAS also. Grain yield from pre-emergence fluchloralin applied plot was taken as a base for calculating weed index indicating yield loss caused by different weed control treatments. The highest weed index was recorded in unweeded control (83.5 per cent) followed by mulching of redgram leaf litter (65.5 per cent). The minimum weed index was recorded by mulching of *Eucalyptus* leaf litter (18.8 per cent) as compared to other treatments.

Grain yield of greengram was significantly altered by different weed control treatments. The highest grain yield (871.66 kg ha^{-1}) was obtained under pre-emergence application of fluchloralin + one hand weeding. This was followed by mulching of *Eucalyptus* leaf litter (707.67 kg ha^{-1}) mulching of sweet potato fresh vine residues (649.34 kg ha^{-1}), mulching of sunflower stalk residues (607.14 kg ha^{-1}) and mulching of mango seednut pulp (558.14 kg ha^{-1}). The lowest greengram yield (235.0 kg ha^{-1}) was recorded under unweeded control.

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Research Notes

Effect of agronomic practices for multi-blooming in greengram (*Vigna radiata* L.) (Cv. Pusa bold)

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A field experiment was conducted at wet land farm of Tamil Nadu Agricultural University, Coimbatore during Summer 2001 in order to study the effect of foliar application of urea, Di-Ammonium Phosphate (DAP) and Naphthalene Acetic Acid (NAA) on the growth and yield of greengram var. Pusa bold. The experiment was laid out in randomized block design with three replications. The various treatment combinations involving Nitrogen, DAP and NAA include 25:50:0 kg NPK ha^{-1} basal alone (T_1), 25:50:0 kg NPK ha^{-1} + 12.5 kg N ha^{-1} (soil) at 55 DAS + 12.5 kg N ha^{-1} (soil) at 65 DAS (T_3), 25:50:0 kg NPK ha^{-1}+ 12.5 kg

Table 1. Effect of agronomic practices on growth, yield parameters and yield of multi-bloom greengram

Treat-ments	Plant height at harvest (cm)	LAI at flower-ing	DMP at flower-ring (kg ha^{-1})	No. of pods plant^{-1} (Pooled*)	No. of seeds pod^{-1} (Pooled*)	No. of flowers plant^{-1} (Pooled*)	100 seed weight (g)	Grain yield (kg ha^{-1})				Haulm yield at final harvest (kg ha^{-1})
								I picking	II picking	III picking	IV picking	
T_1	45.4	2.47	1218	19.4	12.5	10.6	4.02	499	56	26	581	923
T_2	47.3	2.52	1380	25.0	14.4	15.9	4.20	328	193	48	569	1038
T_3	53.4	2.86	1426	28.5	15.3	17.4	4.20	288	204	112	604	1118
T_4	58.4	3.16	1626	46.5	17.7	22.0	4.31	427	352	128	907	1673
T_5	62.7	3.39	2018	47.7	18.5	24.0	4.47	392	346	186	924	1734
T_6	54.2	3.16	1511	33.8	17.1	18.6	4.29	415	292	64	771	1303
T_7	54.1	3.08	1523	35.6	17.9	20.1	4.26	502	288	117	907	1318
T_8	56.7	3.05	1521	38.2	18.0	20.1	4.23	488	264	146	898	1488
T_9	61.4	3.26	1823	49.5	17.9	22.2	4.40	512	361	139	1012	1720
T_{10}	68.2	4.38	2244	58.0	18.7	26.3	4.49	375	368	198	941	1884
SEd	2.3	0.18	98	2.0	0.3	0.4	0.19	26	17	7	30	61
CD (P=0.05)	4.9	0.37	206	4.6	1.2	1.2	NS	55	38	17	64	128

* Pooled over three picking

N ha^{-1} (foliar) at 55 DAS (T_4), 25:50:0 kg NPK ha^{-1} + 12.5 kg N ha^{-1} (foliar) at 55 DAS +12.5 kg N ha^{-1} (foliar) at 55 DAS + 12.5 kg N ha^{-1} (foliar) at 65 DAS (T_5), 25:50:0 kg NPK ha^{-1} + 2% DAP (twice) + 40 ppm NAA at 45 DAS (T_6), 25:50:0 kg NPK ha^{-1} + 2% DAP (twice) + 40 ppm NAA at 45 DAS + 2% DAP + 40 ppm NAA at 55 DAS (T_7), 25:50:0 kg NPK ha^{-1} + 2% DAP (twice) + 40 ppm NAA at 45 DAS + 2% DAP + 40 ppm NAA at 55 DAS + 2% DAP + 40 ppm NAA at 65 DAS (T_8), 25:50:0 kg NPK ha^{-1} + 12.5 kg N ha^{-1} (foliar) + 40 ppm NAA at 55 DAS (T_9), 25:50:0 kg NPK ha^{-1} + 12.5 kg N ha^{-1} (foliar) with 40 ppm NAA at 55 DAS+12.5 kg N ha^{-1} (foliar) with 40 ppm NAA at 65 DAS (T_{10}). DAP was applied on 20th and 45th DAS in the DAP twice treatments. The soil of the experimental field was well drained with clay loam in texture having pH of 7.3, low in available N (152.5 kg ha^{-1}), medium in available P (15.3 kg ha^{-1}) and high in available K (284.3 kg ha^{-1}). Greengram variety Pusa bold was selected for the study and sown during March 2001 and harvested during May 2001. Nitrogen was applied as urea and phosphorus and potassium were applied as with single super phosphate and muriate of potash respectively. These nutrients were applied through soil. In the case of foliar spraying, urea and DAP were used. Three blooms were allowed by irrigating the crop after each harvest. Additional irrigation

was given uniformly to all the treatments after each harvest. The crop was raised with a spacing of 30 x 10 cm and all the recommended package of practices were followed. Growth parameters such as plant height, leaf area index (LAI), dry matter production (DMP), yield parameters viz. number of flowers plant^{-1}, pods plant^{-1}, seeds pod^{-1}, 100 seed weight and grain yield at different harvests as well as haulm yield at final harvest were recorded as per the standard procedures.

Growth parameters

Various treatment combinations significantly influenced the growth parameters such as plant height (cm) at harvest, LAI and DMP at flowering (Table 1). Application of 12.5 kg N ha^{-1} as urea with 40 ppm NAA as foliar spray at 45, 55 and 65 DAS (T_{10}) recorded significantly higher plant height (68.2 cm) as compared to foliar spraying of urea alone (62.7 cm) and DAP (56.7 cm). LAI at flowering also registered higher values with the foliar application of N @ 12.5 kg ha^{-1} along with NAA (T_{10}) compared to control and other treatments. DMP at flowering also registered the same trend (2244 kg ha^{-1}) with 12.5 kg ha^{-1} of N + 40 ppm NAA as foliar spray compared to N alone applied @ 12.5 kg ha^{-1} (2018 kg ha^{-1}). However application of DAP @ 2 per cent along with NAA spray (T_8) also favourably influenced the DMP at flowering (1521 kg ha^{-1}) compared to control (1218 kg ha^{-1}). The attributing reason for higher plant height, LAI and DMP might be due to greengrams rejuvanile habit with extra irrigation and additional supply of N and P as foliar spraying. Similar finding was also reported by Vaithilingam *et al*. (1995).

Yield parameters

Yield parameters *viz*. no. of flowers plant^{-1}, no. of pods plant^{-1}, no. of seeds pod^{-1} were influenced by various treatments and their combinations involving foliar spraying of nitrogen and DAP along with NAA at different stages of crop growth (Table 1). Foliar spraying of Nitrogen @ 12.5 kg N ha^{-1} along with NAA (T_{10}) registered highest number of flowers (26.3) followed by 12.5 kg N ha^{-1} (foliar spray) alone. Spraying of 2 per cent DAP with 40 ppm NAA also registered significantly higher no. of flowers plant^{-1} compared to control. The no. of pods plant^{-1} and no. of seeds pod^{-1} were also higher with foliar spraying of 12.5 kg N ha^{-1} along with NAA (T_{10}) (58.0 and 18.7 respectively). However various multi-bloom practices did not influence on the 100 seed weight of greengram. The reasons for more number of flowers plant^{-1}, pods plant^{-1} and no. of seeds pod^{-1} might be due to the balanced metabolism maintained continuously inside the plant to subsequent phases of growth. These results are in conformity with the findings of Ravi (1998).

Grain and haulm yield

The influence of different treatments on the grain yield of first harvest was not much pronounced (Table 1). However the treatments T_7 to T_9 were in first order. Application of 12.5 kg urea ha^{-1} as foliar spraying combined with 40 ppm NAA spray (T_{10}) had recorded higher grain yield of 368 and 198 kg ha^{-1} in the second and third harvest respectively, which was on par with the foliar spraying of urea @ 12.5 kg ha^{-1} without NAA at 55 and 65 DAS. In the pooled grain yield this treatment recorded 74 per cent increase over control (T_1). The next best treatment was application of 2% DAP at 25, 45, 55 and 65 DAS which recorded the grain yield of 292 kg ha^{-1} without NAA spray during second harvest. Soil application of urea did not influence the blooming as well as grain yield compared to control. Highest haulm yield of 1884 kg ha^{-1} was recorded with T_{10} treatment compared to control (923 kg ha^{-1}). The foliar spraying could be exploited favourably for indeterminate crop for the prolonged and continuous translocation of more and more photosynthates from the second and third phase of the respective vegetative stage. Apart from this delayed leaf senescence may also attributed for the increase in yield. The results are in concurrence with Vaithilingam *et al*. (1995) and Kalarani and Jayakumar (1998).

To conclude that, foliar spraying of 12.5 kg urea ha^{-1} along with 40 ppm NAA at 45, 55 and 65 DAS can be recommended to the pulse farmers in order to harness the yield potential of "Pusa bold" greengram variety.

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Research Notes

Response of greengram to varied concentrations of Panchakavya (organic nutrition) foliar application

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Green revolution over years has enhanced the vulnerability of natural resources to degradation. At this context, a keen awareness has been created on the adoption of "Organic Farming" as a remedy to maneuver the illeffects from modern chemical agriculture (Kunnel, 1997). It is very much essential now to develop a technically feasible package involving organic resources for various crops. Panchakavya is a foliar nutrition prepared by organic growers of Tamil Nadu as an indigenous material and used widely for agricultural and horticultural crops (Natarajan, 2002).

In Sanskrit, Panchakavya means a combination of five products obtained from cow. When suitably mixed and used, it has positive influence on living orgnanisms. It has got reverence in Hindu literature also. The products from cow have the ability to bring the flow of cosmic energy. Cosmic energy, when made to pass through a living system, removes the imbalances in terms of physical, chemical, biological and physiological aspects and harmonizes the basic elements which revitalize the growth process (Natarajan, 2002). Panchakavya is used in crops as foliar spray, soil application along with irrigation water, seed or seedling treatment etc. Spraying two rounds of Panchakavya, one before the flower initiation and another during pod setting phase gives quick flowering and high setting percentage. In jasmine it ensures continuous flowering and in annual moringa sprayings double the fruit yield besides giving resistance to pest and diseases (Vivekanandan, 1999). For foliar spray 3% concentration is being adopted by organic farmers using hand-operated sprayers with high pore sized nozzle (Natarajan, 2002).

Field experiment was conducted during *kharif* 2002 to investigate the response of greengram (CO4) to varied concentrations of Panchakavya (organic nutrition) foliar application. The experiment was laid out in the eastern block farm of Tamil Nadu Agricultural University,