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EFFECT OF SLOW RELEASE NITROGENOUS FERTILIZERS ON THE INCIDENCE OF PESTS OF RICE

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Studies carried out to investigate the effect of slow release nitrogenous fertilizers with different levels of nitrogen (N) on mahagement of rice pests indicated that application of prilled urea with need based plant protection recorded less population of green leafhopper (GLH) and less percentage of gall fly damage as well as stem borer white ears. Neem blended urea (5:1) also recorded less population of GLH and earhead bug. Coal tar coated urea registered less white ears due to stem borer. Increased doses of nitrogen from 75 to 150 kg/ha was found to increase the population/damage of above pests and less incidence of pests was observed at low dose of nitrogen (75 kg N/ha). Coal tar coated urea and prilled urea plus need based plant protection registered higher grain yield. Among the nitrogen levels, 125 and 150 kg N/ha resulted higher grainyiel d.

Judicious application of fertilizers is known to be effective in controlling insect pests (Hagen, 1975) especially the use of slow release nitrogen formulations not only in minimising pest infestation but also maximising the yield (Chelliah, 1984). The effectiveness of neem blended urea in reducing stemborer damage was reported by Alagarsamy *et al.* (1985). In the light of the effectiveness of slow release fertilizers of nitrogen in reducing the incidnece of pests, experiments were conducted during 1984-85 with different forms of urea and results are furnished in this paper.

MATERIALS AND METHODS

Two field experiments were conducted in a factorial randomised block design, replicated thrice with twenty four treatments (6 nitrogen sources x 4 levels of nitrogen) in two seasons *viz* July to October, 1984 (Kar season) as well as October 1984 to February 1985 (Pishanum season). Twenty six day old seedlings were transplanted in plots of size 3 X 3 m @ 2 seedlings per hill with a spacing of 20 × 10 cm. Basal application of K_2O @ 60 Kg/ha was applied as per soil test recommendation and no P_2O_5 was applied as the soil was rich in P_2O_5. The varieties TKM 9 and IR 20 were raised in the first and second seasons respectively.

The treatments consisted of neem cake blended urea, coal tar coated urea, sulphur coated urea, gypsum coated urea, prilled urea each with 4 doses *viz.*, 75, 100, 125 and 150 kg N/ha as well as prilled urea in the above doses plus need based plant protection totalling (6 treatments × 4 doses) 24 variants.

Neem cake blended urea was prepared by mixing 100 kg urea (46.2% N) with 20 kg of finely powdered

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neem cake and adding two litres of kerosene by thorough shaking in a container to have an uniform blending. The mixture was kept overnight before application.

Sulphur coated urea (41. % N & 7% S), gypsum coated urea (39. 72 % N 4.59% Ca and 11.29% SO_4) were obtained from M/s SPIC, Tuticorin for experimental purpose.

Fifty per oent of fertilizers were applied basally. The balance 50% N was applied in 2 splits @ 25% N each at tillering stage and at panicle initiation stage.

The nursery was treated with carbofuran 3 g@ 1. 4 kg/8 cents 10 days prior to pulling out of seedlings followed by spraying of phosphamidon 85 EC, @ 250 ml/ha on 20 DAT and monocrotophos 36 WSC @ 500 ml/ha on 45 DAT were given in the first and second experiments respectively.

Observations were made on the incidence of gall midge, stem borer green leafhopper and earhead bug from five hills chosen at random per plot at 10 days interval commencing from 15 DAT.

Gall midge damage was assessed by counting the total and affected tillers exhibiting silver shoots from 5 hills on 45 DAT and expressed in percentage. The stem borer incidence was also observed by counting the total tillers and tillers exhibiting deadhearts as well as whiteheads a week prior to harvest and the damage was expressed in percentage. The population of greenleafhopper (GLH) and earhead bug was counted on 45 DAT and at milky stage of the crop respectively from 5 sweeps per plot using handnet having a size of 20 cm diameter and 40 cm length. Yield data were gathered at harvest. The percentage data were transformed into arcsin values and population into square-root transoformation for statisticsal analyses under FRBD.

RESULTS AND DISCUSSION

The statistical analysis of the data on GLH population in the first experiment revealed that there was no significant difference in GLH population among the levels of N but different forms of urea exhibited a significant difference in GLH population (Table 1). Application of prilled urea with need based plant protection recorded less population of GLH (4.1) followed by neem blended urea (4 3/5 sweeps) In the second experiment, the differences in GLH population between treatments, forms to urea and interaction were significant. Application of prilled urea with need based plant protection recorded less population of GLH with 150 Kg N followed by 75 Kg N/ha (Table 2). The population of GLH was in an increasing trend from 75 to 125 kg N/ha and it decreased at 150 kg N/ha The reduction of GLH at 150 kg N was due to the deleterious effect of excessive nitrogen on the feeding activity of insect (Dhaliwal *et al.*, 1980a, b). These results are in conformity with the findings of Mathew *et al* (1974) and Narayanasamy *et al.* (1976) But Samiyappan (1983) concluded that combination of 100 kg N as prilled urea and 50 kg K_2O/ha resulted in an increase in GLH and brownplanthopper in rice.

Among the interaction, neem cake blended urea @ 75 kg N/ha recorded less population of GLH compared to control (without urea). Similar results were also obtained from the plots treated with 10 and 20% neem cake blended urea at IRRI (Anon., 1981).In addition, Mathew *et al.* (1974) concluded that the highest level of nitrogen must be accompanied with suitable plant protection measures to secure higher yield

With regard to stem borer, there was very low incidence of deadhearts and existed significant difference in whiteears among the treatments in the first experiment. Coal tar coated urea and prilled urea with need based plant protection were on a par in recording less percentage of whiteears. Among the doses 75kg N/ha resulted low whiteears incidence (Table 3). Application of coal tar coated urea @ 8% was known to result in relatively less stem borer incidence than in prilled urea (Anon, 1980).

Gall midge incidence was less in the plots treated with prilled urea with plant protection in the second experiment. All slow release nitrogenous forms resulted an increase in gall fly damage As the nitrogen levels increased the gall fly incidence was increased but less percentage of damage was noticed at 75 Kg N/ha (Table 4). The increase in doses of N leading to enhancement of gall midge infestation has been well documented by Mathew *et al.* (1974) and Saroja *et al.* (1982).

Neem blended urea recorded 3.4 bugs as against 14.1 bugs/5 sweeps and 75 kg and 100 kg N/ha resulted 7.6 and 7.5 bugs respectively as against 11.0 bugs/5 Sweepsin 150 kg N/ha (Table 5). The direct relationship between the incidence of earhead bug and nitrogen levels was also reported by Mathew *et al.* (1974) and top dressing of neem blended urea on 35 DAT would have been influenced in the reduction of bug population.

The statistical analysis of the data on grain yield indicated that coal tar coated urea in the first experiment recorded higher yield (5462 kg/ha) followed by prilled urea with protection (5388 kg /ha) (Table 6) and no difference was observed in yield level among the different forms of urea in the second experiment. Among the doses of N, 150 kg N and 125 kg N/ha in the first experiment recorded an yield of 54.80 kg, 5369 kg (Table 6) and 3400 kg/ha (Table 7) respectively. The superior efficiency of split application of coal tar coated urea is in agreement with the results of Krishnarajan *et al* .(1981).

As the dose of nitrogen increased from 75 to 150 kg/ha, the corresponding increase in yield could be realised. Such proportionate increase of N from 50 to 150 kg/ha had resulted higher grain yield as reported by Mahajan *et al* (1981).

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Table 1. Effect of slow release nitrogenous fertilizers and urea on the incidence of rice green leaf hopper (July to October, 1984) (Mean GLH population/5 netsweeps on 45 DAT)

Levels of N/ Forms of Urea	kg/ha 75	100	125	150	Mean
Neem cake blended urea	2.6 (1.62)	3 9 (1.98)	6.1 (2.46)	4.9 (2.21)	4.3 (2.07)at
Tar coated urea	4.6 (2 15)	5.5 (2.34)	7.0 (2 65)	5.6 (2.36)	5.7 (2.38)bc
Sulphur coated urea	5.7 (2.39)	6.6 (2.57)	5.2 (2.27)	5.0 (2 24)	6.0 (2.45)c
Gypsum coated urea	5.6 (2.36)	3.5 (1 86)	8.6 (2.93)	7.3 (2.71)	4.9 (2.22)abc
Urea — protected	3 3 (1.82)	3.5 (1.86)	5.3 (2.30)	4.6 (2.15)	4 1 (2.03)a
Urea — not protected	5.2 (2.29)	7.6 (2.76)	8.0 (2.82)	7.2 (2.68)	7.0 (2.64)d
Mean	4.0 (2.11)	5.0 (2.23)	7 5 (2.74)	6.0 (2.45)	

(Figures in parentheses are transformed values)
Means followed by same letters are not significantly different by DMRT at P=0.05

Comparison of significant effects	SE	CD (P=0.05)
Between levels of N	0.14	NS
Between forms of urea	0.12	0.33
Interaction	0.28	NS

Table 2. Effect of slow-release nitrogenous fertilizers and urea on the incidence of green leafhoppers (October 1984 to February 1985) (Mean green leabfhopper population15 net sweeps/ on 45 DAT)

Levels of N/ Forms of urea	kg/ha 75	100	125	150	Mean
Neem blended urea	403.5	106.9	10.14	98.6	102.1
Coated urea	(10.16)d	(10:34)d	(10.07)d	(9.93)c	(10 10)b
Sar coated urea	104.7	113.9	107.5	104.9	107 7
	(10 23)d	(10,67)e	(10.37)d	(10 24)d	(10 38)b
Sulphur coated urea	108.2	102.2	124.5	81 9	103.9
	(10.45)d	(10.11)d	(11.16)e	(9.05)b	(10 19)
Gypsum coated urea	121.7	130.0	135.0	85 0	117.1
	(11.03)e	(11.40)e	(11.62)e	(9.23)ab	(90.82)c
Urea-protected	77.3	83.5	82.3	88.2	82.8
	(8.79)a	(9.14)ab	(9.07)ab	(9.39)bc	(9.10)a
Urea-not protected	97 6	108.0	113.6	100 0	104.7
	(9.88)cd	(10 39)d	(10.66)e	(10.00)d	(10.23)t
Mean	101,8	107.0	110.1	93.0	
	(10.09)b	(10.34)c	(10,49)c	(9,64)a	

Figures in parentheses are transformed values
Means followed by same letters are not significantly different by DMRT at P= 0.05

Comparison of signifilacnt effects	SE	CD (P = 0.05)
Between levels of N	0.084	0 24
Between forms of urea	0.10:	0.29
Interaction	0.20E	0 59

Table 3. Effect of slow release nitrogenous fertilizers and urea on the incidence of white heads of stem borer of rice (July to October, 1984) (Mean incidence of whiteears percentage)

Levels of N/ Forms of Urea	Kg/h 75	100	125	150	Mean
Neem blended urea	3.7 (11.12)	5.0 (12.88)	4.0 (11.58)	5.6 (13.67)	4.6 (12.31)b
Tar coated urea	3.4 (10.62)	3.3 (10.45)	4.2 (11.77)	4.8 (12 66)	3.9 (11.38)a
Sulphur coated urea	3.5 (10.76)	4.5 (12.29)	5.1 (13.11)	6.6 (14.91)	4.9 (12.77)bc
Gypsum coated urea	4.0 (11.58)	4 0 (11.51)	5.3 (13.32)	6.4 (14.70)	4.9 (12.78)c
Urea-protected	2.7 (9.44)	4.7 (12.58)	4.2 (11 81)	4.1 (11.63)	3.9 (11.37)a
Urea not protected	4.5 (12 29)	4 8 (12 61)	6,0 (14.19)	6.7 (14.99)	5 5 (13 52)c
Mean	3.6 (10.97)a	4.4 (12.05)b	4.8 (2 63)b	5.7 (13.76)c	

Figures in parentheses are transformed values)
Means followed by same letters are not significantly different by DMRT at P = 0.05

Comparison of significant effects	SE	CD (P = 0.05)
Between levels of N	0,23	0.66
Between forms of urea	0.28	0.81
Interaction	0 57	NS

Table 4. Effect of slow release nitrogenous fertilizers and urea on the incidence of rice gall midge (October 1984 to February 1985) (Mean per cent damaged shoots by gall midge on 45 DAT)

Levels of N/ Forms of urea	Kg/ha 75	100	125	150	Mean
Neem blended urea	38.3 (38 23)	47 8 (43.74)	39.3 (38.84)	51.6 (45.92)	44 3 (41 70)c
Tar coated urea	42.0 (40.41)	38.3 (38.12)	47.2 (43.41)	49.8 (44.90)	44.3 (41.73)c
Sulphur coated urea	29.6 (32.99)	38.1 (38.12)	29.8 (33.17)	30 5 (33.51)	32.0 (34.48)b
Gypsum coated urea	30.0 (33.26)	32.6 (34.81)	25.6 (30.41)	30.5 (33.50)	29.6 (32.99)b
Urea-protected	27.2 (31 47)	28 1 (32.01)	29.2 (32.73)	30.0 (32.77)	28.9 (32.50)a
Urea-not protected	30.9 (33.77)	31.2 (33.91)	32 5 (34.74)	30.7 (33.60)	30.3 (34.00)b
Mean	32.9 (35.02)a	35.9 (36.80)ab	33.8 (35.55)ab	37.1 (37.53)ab	

Figuress in parenthese are transformed values
Means followed by same letters are not signicantly different by DMRT at (P = 0.05

Comparison of significant effects	SE	CD (P = 0.05)
Between levels of N	0,20	0.57
Between forms of urea	0.24	0.70
Interaction	0.49	1.39

Table 5. Effect of slow release nitrogenous fertilizers (urea) on the incidence of rice earhead bug (July to October 1984) (Mean population of earhead bugs/5 net sweeps taken on 60 DAT)

Levels of N/ Forms of urea	kg/ha 75	100	125	150	Mean
Neem blended urea	3.3 (1.82)	2.9 (1.71)	4.8 (2.19)	2.6 (1.62)	3.4 (1.84)a
Tar coated urea	3.9 (1.98)	5.3 (2.30)	4 8 (2.20)	9.5 (3.08)	5.7 (2.39)b
Sulphur coated urea	8.9 (2.98)	11 5 (3.39)	7.6 (2.75)	6.8 (2 60)	8.6 (2 93)c
Gypsum coated urea	8.2 (2.87)	7.8 (2.80)	12.5 (3.54)	14.7 (3 83)	10.6 (3.26)d
Urea-protected	11.7 (3.42)	6.8 (2.60)	14.1 (3.75)	18.2 (4.26)	12.3 (3.51)de
Urea-not protected	11.7 (3.42)	13.1 (3.62)	12.2 (3.49)	19.8 (4.45)	14.1 (3.75)e
Mean	7.6 (2.75)a	7.5 (2.74)a	8.9 (2.99)	11.0 (3.31)b	

Figures in parentheses are transformed values)
Mean followed by same letters are not significantly different (P= 0.05)

Comparison of significant effects	SE	CD (P=0.05)
Between levels of N	0.19	0.54
Between forms of urea	0.15	0 44
Interaction	0.38	NS

6. Effect of slow release nitrogenous fertilizers (urea) on rice grain yield (July to October, 1984)

Levels of N/ Forms of urea	Mean grain yield (Kg/ha) 75	100	125	150	Mean
Neem blended urea	5110	5184	5258	5480	5259ac
Tar coated urea	5332	5406	5480	5629	5462a
Sulphur coated urea	4888	5110	5629	5629	5314ab
Gypsum coated urea	4666	5406	5258	4110	5110b
Urea- protected	5184	5184	5703	5480	5388a
Urea-not protected	4666	5110	4888	5555	5055c
Mean	4975b	5234ab	5369a	5480a	

Mean followed by same letters are not significantly different (P = 0.05)

Comparison of significant effects	SE	CD (P = 0 05)
Between levels of N	111	316
Between forms of urea	91	253
Interaction	222	NS

Table 7. Effect of slow release nitrogenous fertilizers (urea) on rice grain yield (October 1984 to February 1985)

Levels of N/ Forms of urea	Mean grain yield (kg/ha) 75	100	125	150	Mean
Neem blended urea	2886	3184	3333	3259	3166
Tar coated urea	3000	3147	3407	3333	3221
Sulphur coated urea	2925	3221	3333	3221	3175
Gypsum coated urea	2926	3147	3407	3296	3194
Urea-protected	3074	3221	3666	3555	3379
Urea-not protected	3037	3074	3259	3333	3175
Mean	2975b	3166ab	3400a	3333a	

Mean followed by same letters are not significantly different (P=0.05)

Comparison of significant effects	SE	CE(P=0.05)
Between levels of N	73	208
Between forms of urea	90	NS
Interaction	180	NS

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