Influence of Weed Management Practices on Nutrient Uptake and Productivity of Rice under Different Methods of Crop Establishment

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Abstract

An experiment was conducted during *kharif* season of 2010 and 2011 at College Farm, Rajendranagar, Acharya N.G. Ranga Agricultural University, Hyderabad. The experiment was laid out in split plot design with three replications. The treatments consisted of three rice establishment methods (direct sowing of sprouted seeds under puddled condition, System of Rice Intensification and transplanting) as main plot treatments and four weed management practices (bensulfuron methyl 60 g a.i ha^{-1} + pretilachlor 600 g a.i ha^{-1} fb mechanical weeding at 30 DAS/T, bispyribac sodium @ 25 g a.i ha^{-1}, farmer's practice and weedy check) as sub plot treatments. The results of the experiment indicated that farmer's practice (hand weeding twice at 20 and 40 DAS/T in direct sown rice and transplanted rice and cono weeding thrice from 20 DAT with 10 days interval in SRI) of weeding resulted in significantly lower weed density, weed dry weight and lower removal of nutrients by weeds resulting in superior grain yield and higher uptake of nutrients by rice and it was on par with bensulfuron methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T due to better control of weeds leading to lower removal of nutrients by weeds and higher nutrient uptake by grain. Among the establishment methods, transplanting method of establishment resulted in significantly higher grain yield due to lower weed density and as well as lower weed dry weight and it was comparable with SRI.

Key words: Weed density, weed dry weight, grain yield and uptake.

Rice (*Oryza sativa* L.) crop suffers more from weed competition unlike other cereal crops. The degree of competition and extent of yield losses vary greatly with rice cultures. Weeds compete with crop plants for moisture, nutrients, light, space and other growth factors and in the absence of an

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effective control measures, remove considerable quantity of applied nutrients resulting in a significant yield losses. Weeds cause substantial losses in yield through production of growth inhibiting compounds a phenomenon referred as allelopathy (Yaduraju *et al*., 2005). Weed infestation and weed competition are more in direct seeded rice as compared to transplanted rice and SRI because the land is exposed till the initial seedling establishment in direct seeded rice. Crop establishment and weed management techniques are critical in rice farming. So, present investigation to study the weed infestation and nutrient removal by weeds in different crop establishment methods of rice, their influence on productivity of rice and nutrient uptake by rice was taken up.

Materials and Methods

Field experiment conducted was conducted during *kharif* season of 2010 and 2011 at College Farm, College of Agriculture, Rajendranagar, Hyderabad. The soil of the experimental site was sandy loam in texture with pH of 7.8 and available nitrogen (234.5 kg ha^{-1}), available phosphorus (28.9 kg ha^{-1}) and potassium (271.6 kg ha^{-1}). The experiment was laid out in a split plot design with three crop establishment methods as main plots i.e. SRI (M_1), Direct sowing of sprouted seeds under puddled condition (M_2) and transplanting (M_3) and four weed management practices as sub-plots i.e. bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} applied on followed by mechanical weeding at 30 DAS/T (S_1), bispyribac sodium @ 25 *a.i* ha^{-1} (S_2) as early post emergence, famer's practice (hand weeding twice at 20 and 40 DAS in direct seeded rice and transplanted rice, conoweeding thrice from 20 DAT with 10 days interval in SRI) (S_3) and unweededcheck (S_4) replicated thrice. The crop was fertilized with 120 kg N, 60 kg P_2O_5 and 40 kg K_2O ha^{-1}. Half dose of N (60 kg ha^{-1}) and full dose of phosphorus (60 kg ha^{-1}) and potassium (40 kg ha^{-1}) was applied basal before sowing. The remaining half nitrogen (60 kg ha^{-1}) was top dressed in two equal splits at tillering and panicle initiation stages. Bensulfuron ethyl + pretilachlor mixture @ 60 + 600 g a.i ha^{-1} was applied at 3 DAS/T (S_1) by mixing with sand and followed by a mechanical weeding with push hoe at 30 DAS/T. Bispyribac sodium (S_2) @ 25 g a.i ha^{-1} was applied when, weeds were at 2-3 leaf stage. A thin film of water is maintained at the time of herbicide application. Farmer's practice (S_3) comprises hand weeding twice at 20 and 40

DAS/T was carried out in normal transplanting and direct seeding of sprouted seeds, conoweeding thrice from 20 DAT with 10 days interval in SRI. The un-weeded control as weedy check (S_4) was kept undisturbed for the entire cropping period. Weed density and weed dry weight was recorded and their original values transformed using $\sqrt{x} + 2$ and for nutrient depletion by weeds also square root transformation was done. Nursery sowing for SRI and transplanting was done on the day of direct sowing of sprouted seeds. Direct sowing and nursery sowing for normal transplanting and system of rice intensification were done simultaneously on same day in both years.

Results and Discussion

Weed density (m^{-2}) and Weed dry weight (g m^{-2})

Crop establishment methods exerted significant influence on the weed count (m^{-2}) and weed dry weight (g m^{-2}) recorded at 60 DAS (Table 1).Total weed density recorded in transplanting (57.00 and 52.52 m^{-2}) and SRI (64.48 and 57.43 m^{-2}) were at par and in turn were significantly lower compared to direct seeded rice (75.63 and 66.69 m^{-2}) under puddle condition. Similar trend was noticed with respect to total weed dry weight. The total weed density and dry weight of weeds were higher (43.49 and 39.47 g m^{-2}) under direct seeded rice (sprouted seeds) under puddle condition compared to transplanting (33.73 and 32.20 g m^{-2}) and SRI (37.67 and 33.67 g m^{-2}) which might be due to failure to maintain flooded conditions in field and non-submergence of crop in the initial stages, crop and weeds germinate simultaneously so competition exists. These results are in conformity with those of Subramanayam *et al.* (2007).

Weed management practices had significant influence on the total weed count and total weed dry weight. Famer's practice of weeding (hand weeding twice at 20 and 40 DAS in direct seeded rice and transplanted rice and conoweeding thrice from 20 DAT with 10 days interval in SRI) recorded significantly lower weed count (29.31 and 25.65 m^{-2}) and weedy weight (11.25 and 8.74 g m^{-2}) and it was on par with bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T (34.68 and 31.45 m^{-2} and weed dry weight 15.32 and 11.86 g m^{-2} respectively during 2010 and 2011) and in turn significantly lower compared to other treatments. This is due to frequent removal

of broad spectrum of weeds and similar observations were reported by Bali *et al*. (2006). Weedy check recorded significantly higher weed count and weed dry weight during both the years. Interaction between rice crop establishment methods and weed management practices was found to be non significant during both the years.

Grain yield (kg ha^{-1})

Grain yield of rice influenced significantly by rice establishment methods and weed management practices. Transplanting method recorded significantly higher grain yield (4408 and 4593 kg ha^{-1}) and it was on par with SRI (4266 and 4438 kg ha^{-1}) and both were registered significantly superior grain yield over direct seeded rice (3894 and4075 kg ha^{-1}) under puddle condition. Submerged conditions in transplanted rice facilitate availability of more mineralized form of N, P and K uptake in transplanted rice than that of direct sowing which encouraged tiller production in addition contributed to higher dry matter production and grain yield. Similar findings were observed by Shashikumar (1990).

Among weed management practices, higher grain yield (5601 and 5857 kg ha^{-1}) and was recorded in S_3 *i.e.* farmer's practice (two hand weedings at 20 and 40 DAS in direct seeded rice and transplanted rice and con weeding in SRI) was at par with bensulfuron methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T (5326 and 5585 kg ha^{-1}) and in turn these two treatments were significantly superior over other treatments during both the years. The higher grain yield with bensulfuron methyl is due to decreased weed competition and minimum nutrient removal by weeds which might have increased the capacity of nutrient uptake and enhanced the source and sink sizes which inturn increased the yield attributes *viz*., panicle number per hill, panicle length and filled grains per panicle. Saha and Rao (2010) and Sunil *et al*. (2010) found similar type of findings in their study. Significant interaction was not found between rice establishment methods and weed management practices.

Straw yield (kg ha^{-1})

Transplanting method of establishment recorded significantly higher straw yield (5579 and 5811 kg ha^{-1}) compared to SRI (5364 and 5697 kg ha^{-1}) and direct sowing of rice (sprouted seeds) under puddle condition (4949 and 5300 kg ha^{-1}). This is due to less crop weed competition and led to taller plants, more number of tillers and dry

matter production which inturn resulted in higher straw yield. Subramanyam *et al*. (2007) also reported similar results. Treatment farmer's practice of weeding (hand weeding twice at 20 and 40 DAS resulted in significantly higher straw yield (6766 and 7134 kg ha^{-1}) and it was on par with bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T (6489 and 6824 kg ha^{-1}) and both were significantly superior to bispyribac sodium @ 25 g *a.i* ha^{-1} (5203 and 5433 kg ha^{-1}) and weedy check (2911 and 3019 kg ha^{-1}). Higher straw yield was attributed to weed management treatments provided conducive environment and enhanced the growth of rice crop which inturn was reflected in terms of straw yield. These results are in confirmation with the findings of Sanjay *et al.* (2006). Interaction between rice crop establishment methods and weed management practices was found to be non significant during both the years.

Nutrient Removal by Weeds (kg ha^{-1})

Nutrient removal by weeds in direct seeded rice (sprouted seeds) under puddle condition (3.90, 3.53 kg ha^{-1} respectively during both the years) nitrogen, (2.57 and 2.04 kg ha^{-1}) phosphorus and (8.83 and 4.50 kg ha^{-1}) potassium was significantly higher compared to transplanting (2.90 and 2.67 N kg ha^{-1}; 1.65 and 1.46 P kg ha^{-1} and 6.43 and 3.46 K kg ha^{-1} respectively during both the years) and SRI (3.15 and 2.84 N kg ha^{-1}; 1.98 and 1.65P kg ha^{-1} and 6.61 and 3.89K kg ha^{-1}). Shan *et al*. (2012) opined this could be due to the reason that the crop could not suppress the weeds initially due to poor establishment which resulted in more depletion of nutrients by the weeds.

Among weed management practices, S_3 i.e. farmer's practice of weeding (hand weeding twice at 20 and 40 DAS in direct seeded rice and in transplanted rice and cono weeding thrice in SRI) (0.92 and 0.70 N kg ha^{-1} ; 0.41 and 0.32P kg ha^{-1} and 0.95 and 0.86 kg ha^{-1} during both the years respectively) and bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T (1.24 and 0.96 kg N ha^{-1} ; 0.69and 0.45 kg P ha^{-1} and 1.39 and 1.20 K kg ha^{-1} respectively during 2010 and 2011) were recorded significantly lower removal of nitrogen, phosphorus and potassium compared to other treatments. This may be due to control of broad spectrum of weed control in turn resulted in lower biomass accumulation of weeds. The findings of the present study are in conformity with the results obtained by

Jacob and Syriac, (2005). Weedy check recorded significantly higher nitrogen (8.10 and 7.83 kg ha^{-1}), phosphorus (5.31 and 4.54 kg ha^{-1}) and potassium (22.91 and 10.62 kg ha^{-1}) removal by weeds compared to other treatments during two years of experimental study. Similar results were reported by Puniya *et al*. (2007). Nutrient removal by weeds was not influenced significantly due to interaction effect of crop establishment methods and weed management practices.

Nutrient Uptake by Rice grain (kg ha^{-1})

The data on nutrient uptake by rice grain at harvest indicated that nitrogen phosphorus and potassium uptake by rice (62.84 and 65.44 N kg ha^{-1}; 12.40 and 12.92 P kg ha^{-1}; 12.13 and 12.65 K kg ha^{-1}) in transplanting method and SRI(59.96 and 62.38 N kg ha^{-1}; 11.96 and 12.44 P kg ha^{-1} and 12.13 and 12.65 K kg ha^{-1} respectively during both the years) significantly higher compared to direct seeded rice (sprouted seeds) under puddle condition (54.27 and 56.77N kg ha^{-1}; 10.19 and 10.66 P kg ha^{-1} and 10.01 and 10.48 K kg ha^{-1} respectively) and it was due to decreased weed competition in transplanted rice might have augmented the uptake of applied nutrients as well as soil nutrients. Similar effects were reported earlier by Chander and Pandey (1997).

Among weed management practices, treatment farmer's practice recorded significantly higher uptake of nitrogen (80.35 and 83.96 kg ha^{-1}) phosphorus (16.07 and 16.79 kg ha^{-1}) and potassium (15.51 and 16.21 kg ha^{-1}). This was at par with bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T (75.92 and 79.60 N kg ha^{-1}; 15.10 and 15.83 P kg ha^{-1} and 14.82 and 15.55 kg ha^{-1}) and in turn was significantly superior over other treatments during both the years. Higher nutrient uptake is due to better control of weeds leading to lower depletion of nutrients by weeds and higher nutrient uptake by rice. The results are in conformity with the findings of Sanjay *et al*. (2006). Weedy check registered significantly the lowest nutrient uptake by crop. Interaction effect was not found between crop establishment methods and weed management practices.

Nutrient Uptake by Rice Straw (kg ha^{-1})

Significantly higher nutrient uptake (42.94 and 44.71N kg ha^{-1}; 7.31 and 7.62 P kg $ha^{-1}$and 48.53 and 50.55 K kg ha^{-1}) by rice straw was observed with transplanted rice and it was comparable (40.01 and 42.49 N kg ha^{-1}; 6.55 and 6.95P kg $ha^{-1}$and 46.24 and 49.11 kg ha^{-1}) with SRI. The lowest uptake

of nutrients (36.51 and 39.10 N kg ha^{-1} ; 5.55 and 5.95 P kg ha^{-1} and 42.15 and 45.15K kg ha^{-1}) was registered with direct seeded (sprouted seeds) rice under puddle condition. Farmer's practice of weeding recorded significantly higher nutrient uptake by straw (52.04 kg ha^{-1} and 54.85; 8.81 and 9.29 P kg ha^{-1} and 58.93 and 62.14 K kg ha^{-1}) and it was comparable with bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T (49.47 and 52.02 N kg ha^{-1}; 8.25and 8.66 P kg ha^{-1} and 56.61 and 59.52 kg ha^{-1}) in turn was significantly superior over bispyribac sodium. Weedy check resulted in significantly lower uptake of nitrogen (20.82 and 21.60 kg ha^{-1}), phosphorus (2.94 and 3.05 kg ha^{-1}) and potassium (24.14 and 25.04 ha^{-1}) by rice straw. Interaction effects were found non significant between crop establishment methods and weed management practices.

Conclusion

The data revealed that transplanting method of establishment resulted in significantly higher grain yield and it was comparable with SRI and among weed management practice, farmer's practice of weeding recorded significantly higher grain yield of rice and it was on par with bensulfuron-methyl 60 g + pretilachlor 600 g *a.i* ha^{-1} *fb* mechanical weeding at 30 DAS/T due to better control of weeds leading to lower removal of nutrients by weeds and higher nutrient uptake by grain.

Refernces

Bali S.A., Singh M., Kacharoo D., Sharma B.C and Shivram D.R.2006. Efficacy of herbicides in transplanted, medium- duration rice under sub-tropical conditions of Jammu. *Indian Journal of Agronomy* 51(2):128-130.

Chander S. and Pandey J.1997. Nutrient removal by scented basmati rice (Oryza sativa) and associated weeds as affected by nitrogen and herbicides under under different rice cultures. *Indian Journal of Agronomy* 42 (2): 256-260.

Jacob D. and Syriac E. 2005. Relative efficacy of different spacings and weed control methods in scented rice. *Oryza* 42(2): 75-77.

Puniya R., Pandey P.C., Bisht P.S. and Singh D.K. 2007. Nutrient uptake by crop and weeds as influenced by trisulfuron, trisulfuron + pretilachlor and bensulfuron methyl in transplanted rice. *Indian Journal of Weed Science* 39 (3&4): 239-240.

Saha S. and Rao K.S. 2010. Evaluation of Bensulfuron-methyl for weed control in wet direct-sown summer rice. *Oryza* 47 (1): 38-41.

Sanjay M.T., Shetty T.K.P. and Nanjappa H.V. 2006. Enhancing productivity of

rice under different crop establishment methods through weed management practices. *Crop Research* 31 (2): 192-197.

Shan F.A., Bhat M.A., Ganai A.N., Hussain A. and Bhat A.T. 2012. Effect of crop establishment and weed control practices on the performance of rice (Oryza sativa L.). *Applied Biological Research* 14 (1): 79-83.

Shashikumar G. 1990. Effect of age seedlings and nitrogen levels on growth and yield of rice varieties under late planting condition. *M.Sc. (Ag) Thesis, ANGRAU*.

Subramanyam D., Raghava Reddy C. and Srinivasulu Reddy. 2007. Influence of puddling intensity and water management practices on weed dynamics and yield of transplanted rice (Oryza sativa L.). *Indian Journal of Agronomy* 52 (3): 225-330.

Sunil C.M., Shekara B.G., Kalyanamurthy K.N. and Shankaralingappa, B.C. 2010. Growth and yield of Aerobic Rice as influenced by Integrated Weed Management Practices. *Indian Journal of Weed science* 42 (3&4): 180-183.

Yaduraju N.T., Chandrababu and Sushil Kumar. 2005. Biological control of weeds: potential and prospects. In: First International Weed Science Seminar on Innovative Approaches for Eco safety Weed management, 21-24 January, Kolkata, India.

Table 1: Total weed density, weed dry weight, grain yield and straw yield as influenced by crop establishment methods and weed management practices

Treatments	**Weed density (m^{-2})**		**Weed dry weight (g m^{-2})**		**Grain yield (kg ha^{-1})**		**Straw yield (kg ha^{-1})**	
Main treatments	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
M_1 – SRI	8.14(64.48)	7.69 (57.43)	6.29 (37.67)	5.97 (33.67)	4265	4438	5364	5697
M_2 – Direct sown rice	8.81 (75.63)	8.30 (66.69)	6.75 (43.49)	6.44 (39.47)	3894	4075	4948	5300
M_3 – Transplanting	7.68 (57.00)	7.23(52.62)	5.98 (33.73)	5.85 (32.20)	4408	4593	5579	5811
SEm±	0.17	0.15	0.12	0.10	91	90	99	97
CD (5%)	0.66	0.60	0.45	0.41	356	354	387	381
Sub treatments								
S_1 – Bensulfuron methyl + Pretilachlor *fb* mechanical weeding 30 DAS/T	6.06(34.68)	5.78(31.45)	4.16(15.32)	3.72 (11.86)	5326	5585	6489	6824
S_2 – Bispyribac sodium	8.48 (69.92)	7.92(60.80)	5.84(32.13)	5.57 (29.06)	3975	4158	5023	5433
S_3 – Farmer's practice	5.60 (29.31)	5.26(25.65)	3.64 (11.25)	3.28 (8.74)	5601	5857	6766	7134
S_4 – Weedy check	11.44(128.92)	10.94(117.73)	9.82(94.48)	9.63 (90.78)	1854	1874	2911	3019
SEm±	0.17	0.21	0.18	0.19	95	107	106	109
CD (5%)	0.50	0.64	0.54	0.57	283	318	316	323

Values in parenthesis ( ) are original values

Table 2: Nutrient removal by weeds at 60 DAS as influenced by crop establishment methods and weed management practices during 2010 and 2011

Treatments	N uptake (kg ha^{-1})		P uptake (kg ha^{-1})		K uptake (kg ha^{-1})	
Main treatments	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
M_1 – SRI	2.27 (3.15)	2.19 (2.84)	1.99 (1.98)	1.91 (1.65)	2.93 (6.61)	2.43 (3.89)
M_2 – Direct sown rice	2.43 (3.90)	2.36 (3.53)	2.14 (2.57)	2.01 (2.04)	3.29 (8.83)	2.56 (4.50)
M_3 – Transplanting	2.21 (2.90)	2.16 (2.67)	1.91 (1.65)	1.86 (1.46)	2.90 (6.43)	2.34 (3.46)
SEm±	0.04	0.04	0.03	0.02	0.06	0.03
CD (5%)	0.15	0.16	0.14	0.09	0.23	0.12
Sub treatments						
S_1 – Bensulfuron methyl + Pretilachlor *fb* mechanical weeding at 30 DAS/T	1.80 (1.24)	1.72 (0.96)	1.64 (0.69)	1.57 (0.45)	1.84 (1.39)	1.79 (1.20)
S_2 – Bispyribac sodium	2.17 (2.72)	2.10 (2.43)	1.89 (1.59)	1.84 (1.40)	2.43 (3.91)	2.26 (3.12)
S_3 – Farmer's practice	1.71 (0.92)	1.64 (0.70)	1.55 (0.41)	1.52 (0.32)	1.72 (0.95)	1.69 (0.86)
S_4 – Weedy check	3.18 (8.10)	3.14 (7.83)	2.70 (5.31)	2.56 (4.54)	4.99 (22.91)	3.55 (10.62)
SEm±	0.05	0.04	0.05	0.03	0.07	0.05
CD (5%)	0.15	0.13	0.14	0.09	0.21	0.15

Values in parenthesis are original values

Table 3: Nutrient uptake by rice grain (kg ha^{-1}) at harvest as influenced by rice crop establishment methods and weed management practices

Treatments	N uptake (kg ha^{-1})		P uptake (kg ha^{-1})		K uptake (kg ha^{-1})	
Main treatments	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
M_1 – SRI	59.96	62.38	11.96	12.44	11.48	11.96
M_2 – Direct sown rice	54.27	56.77	10.19	10.66	10.01	10.48
M_3 – Transplanting	62.84	65.44	12.40	12.92	12.13	12.65
SEm±	1.42	1.44	0.33	0.33	0.32	0.35
CD (5%)	5.59	5.66	1.28	1.29	1.26	1.37
Sub treatments						
S_1 – Bensulfuron methyl+ Pretilachlor *fb* mechanical weeding at 30 DAS/T	75.92	79.60	15.10	15.83	14.82	15.55
S_2 – Bispyribac sodium	55.21	57.74	10.37	10.84	10.20	10.67
S_3 – Farmer's practice	80.35	83.96	16.07	16.79	15.51	16.21
S_4 – Weedy check	24.62	24.82	4.53	4.56	4.31	4.36
SEm±	1.47	1.54	0.37	0.33	0.26	0.31
CD (5%)	4.37	4.58	1.10	0.98	0.78	0.91

Table 4: Nutrient uptake by rice straw (kg ha^{-1}) as influenced by crop establishment methods and weed management practices

Treatments	N uptake (kg ha^{-1})		P uptake (kg ha^{-1})		K uptake (kg ha^{-1})	
Main treatments	**2010**	**2011**	**2010**	**2011**	**2010**	**2011**
M_1 – SRI	40.01	42.49	6.55	6.95	46.24	49.11
M_2 – Direct sown rice	36.51	39.10	5.55	5.95	42.15	45.15
M_3 – Transplanting	42.94	44.71	7.31	7.62	48.53	50.55
SEm±	0.86	0.79	0.19	0.20	1.02	0.85
CD (5%)	3.36	3.12	0.76	0.80	4.00	3.32
Sub treatments						
S_1 – Bensulfuron methyl + Pretilachlor *fb* mechanical weeding at 30 DAS/T	49.47	52.02	8.25	8.66	56.61	59.52
S_2 – Bispyribac sodium	36.94	39.93	5.88	6.35	42.88	46.37
S_3 – Farmer's practice	52.04	54.85	8.81	9.29	58.93	62.14
S_4 – Weedy check	20.82	21.60	2.94	3.05	24.14	25.04
SEm±	1.09	1.03	0.21	0.22	1.11	0.96
CD (5%)	3.22	3.07	0.63	0.66	3.31	2.86