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Effect of Weed Management and Nitrogen on Weed Dynamics and Yield of Rice under Aerobic Condition

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A B S T R A C T

A field experiment was undertaken during *kharif* of the year 2016 at the Research Farm of Dr. Rajendra Prasad Central Agricultural University, Pusa (Samastipur), Bihar to study the "Effect of weed management and nitrogen on weed dynamics and yield of rice under aerobic condition". The experiment was conducted in split plot design having three levels of nitrogen in main plots (N_1-120kg N/ha, N_2-140kg N/ha and N_3-160 kg N/ha) and six weed management practices [W_1- Pyrazosulfuron @ 25g/ha (20 DAS), W_2-Bispyribac sodium @ 25g/ha (20 DAS), W_3-Pyrazosulfuron @ 25g/ha + Bispyribac sodium @ 25g/ha (20 DAS), W_4-Pendimethalin @ 1000g/ha (PE)+ W_3 (20 DAS), W_5-Weed free (2 Hand weeding at 20 and 40 DAS) and W_6-Weedy check] in sub plots, replicated thrice with Abhishek as the test variety. The results pertaining to weed population and weed dry weight by crop separately were a close reflection of growth and yield pattern in which the pre and post-emergence applications of Pendimethalin @ 1000 g/ha + Bispyribac sodium @ 25 g/ha + Pyrazosulfuron @ 25 g/ha established its superiority over the rest of the herbicidal treatments except in weed free condition wherein all these characters were superior in sub plots. Weed control efficiency of 2 hand weeding (70.81%) was superior to Pendimethalin @ 1000g/ha + Bispyribac sodium @ 25g/ha + Pyrazosulfuron @ 25g/ha (66.13%), Bispyribac sodium @ 25g/ha + Pyrazosulfuron @ 25 g/ha (59.83%), Bispyribac sodium @ 25g/ha (51.48%) and Pyrazosulfuron @ 25g/ha (40.40%). Pendimethalin @ 1.0 kg/ha *fb* Pyrazosulfuron @ 25g/ha + Bispyribac @ 25g/ha recorded highest grain yield (37.50q/ha) and straw yield (48.75q/ha) after manual weeding. High cost involved in manual weeding makes herbicidal treatments more viable proposition. Bispyribac sodium @ 25g/ha + Pyrazosulfuron @ 25g/ha, Bispyribac sodium @ 25g/ha alone and Pendimethalin @ 1000g/ha + Bispyribac sodium @ 25g/ha + Pyrazosulfuron @ 25g/ha are three most effective herbicidal combination treatments in direct seeded rice under aerobic condition.

Introduction

Rice is the world's most important crop and more than half of the world's population depends on it for food, calories and protein especially in developing countries however it is the biggest user of freshwater. Rice production consumes about 30% of all fresh water used worldwide. Flood-irrigated rice uses two to three times more water than other

cereal crops such as wheat and maize. In wet rice cultivation, it takes 2000 to 3000 liters of water to produce 1 kg of rice. However, scarcity of freshwater resources has threatened the production of the flood-irrigated rice crop (IWMI, 2000). By 2025, 15 out 75 million hectare of Asia's flood-irrigated rice crop will experience water shortage (Tuong and Bouman, 2003). So, alternative to transplanting could be aerobic rice because it requires less water, less labour and capital. Aerobic rice system, wherein the crop is established via direct seeding in non- puddled, non-flooded fields are the most promising approach for saving water (Wang *et al.,* 2002; Tuong and Bouman, 2003; Bhushan *et al.,* 2007). Aerobic rice can reduce water application by 44% relative to conventionally transplanted system by reducing percolation, seepage and evaporative loss (Wang *et al.,* 2002; Bouman *et al.,* 2005).

Direct seeded culture has become increasingly important in rice cultivation due to scarcity of farm labour and higher water requirement and higher production cost of transplanted rice (Azmi and Baki, 2007). Direct seeded rice needs only 34% of the total labour requirement and saves 27% of the total cost of the transplanted crop (Mishra and Singh, 2011). Direct seeding of rice also allows early establishment of the succeeding wheat crop.

Aerobic rice system is subjected to much higher weed pressure than conventional puddled transplanted system (Rao *et al.,* 2007) in which weeds are suppressed by standing water. Weeds are the most severe constraints and timely weed management is crucial for increasing the productivity of rice under aerobic condition. Uncontrolled weeds reduce the yield by 96% in dry direct-seeded rice and 61% in wet direct-seeded rice (Maity and Mukherjee, 2008). Therefore, the major challenge for farmers is effective weed management, as failure to eliminate weeds may result in low or no yield. During peak period, the availability of labour is becoming a serious problem by time in all parts of country. So, Herbicides are used successfully for weed control in rice fields for rapid and effective result, easier to application and low cost involvement in comparison to the traditional methods of hand weeding. Several authors reported to Pyrazosulfuron, (Chauhan and Seth, 2013) and Bispyribac-Na as post-emergence (Khaliq *et al.,* 2012) herbicides which are considered to be an alternative to hand weeding. However, selecting a particular herbicide or its combination with mechanical weed management require thorough probe. While selecting a weed control measure it is equally important to keep economic aspects under consideration.

Moreover, direct seeded rice soils are often exposed to dry and wet conditions and difference in N dynamics and losses pathways often results in different fertilizer recoveries in aerobic soils (De Datta and Buresh, 1989). Even high and non-synchronous applied N may limit grain yield due to limited grain filling rate by decrease in post-anthesis assimilates translocation (Zhang *et al.,* 2009). Thus Nitrogen and weeds are the two important factors that influence the productivity of rice under aerobic condition in tropical Asia.

Materials and Methods

The experiment was laid out in Nursery Jhilli Field at Dr. Rajendra Prasad Central Agricultural University, Pusa farm situated on the southern bank of the river *Budhi Gandak* in Samastipur district (25.59^0 N and 84.40^0 E and 52.3 m above the mean sea level). Soil of the experimental site was calcareous (clay loam) and relatively low fertile with pH 8.4, organic carbon 0.43%, available NPK 209, 20.8 and 116.4 kg/ha respectively. The total rainfall of 770.7 mm was recorded during

cropping period of 2016. The experiment was conducted during *kharif* of 2016 in split plot design with three replications. The factors under study comprised three Nitrogen levels i.e. N_1-120 kg N/ha, N_2 -140 kg N/ha, N_3 -160 kg N/ha in main plots and 6 weed management treatments on rice under aerobic condition i.e. W_1 - Pyrazosulfuron @ 25 g/ha (20 DAS), W_2 - Bispyribac sodium @ 25 g/ha (20 DAS), W_3 - Pyrazosulfuron @ 25 g/ha + Bispyribac sodium @ 25 g/ha (20 DAS), W_4 - Pendimethalin @ 1000g/ha (PE) + W_3 (20 DAS), W_5- Hand weeding at 20 and 40 DAS, W_6- weedy check in sub-plots. The variety used was Abhishek. It is long duration (110-115 days) rice variety suitable for irrigated condition. Seed rate was 40 kg/ha and treated seeds were sown in rows with 20 cm row to row spacing.

Half dose of nitrogen (as per the treatments through urea) and full dose of phosphorus and potash (50-30 kg P_2O_5-K_2O/ ha through SSP and MOP) were applied as basal dose at the time of sowing and remaining half dose of nitrogen was applied in two equal split at 30 and 60 DAS i.e. at tillering and panicle initiation stage. Herbicides were applied with the help of Knapsack sprayer fitted with flat fan nozzle. The crop was manually harvested and threshed in the third week of November. Data were recorded on weeds, yield and economics of rice crop. Observations of data on weed density and weed dry weight were recorded using 50 cm x 50 cm quadrate. Data on weeds were subjected to square root transformation before statistical analysis. The Weed control efficiency (WCE) and weed index (WI) were calculated by using following formulae:

$$\text{WCE (\%)} = \frac{\text{Dry weight of weed in control plot} - \text{Dry weight of weed in treated plot}}{\text{Dry weight of weed in control plot}} \times 100$$

$$\text{WI (\%)} = \frac{\text{Yield from weed free plot} - \text{Yield from treated plot}}{\text{Yield from weed free plot}} * 100$$

Results and Discussion

The dominant weed flora in the field was grasses like *Cynodon dactylon, Echinochloa colona,* and *Echinochloa crusgalli,* sedges like *Cyperus rotundus* and *Cyperus iria* and broad leaved weeds like *Physallis minima*, *Dactyloctenium aegyptium*, *Caesulia auxillaris* and *Eclipta alba*. The results revealed that the lowest weed population (11.12 /m^2) and weed dry weight (24.91 g/m^2) were recorded in 120 kg N/ha and highest (17.21 m^2/, 39.44 g/m^2) were recorded in N_3 (160kg/ha) which were significantly superior over rest of the treatments in main plots. This might be due to the higher uptake of N by weed at 160 kg N/ha and lowest uptake at 120 kg N/ha. This result was in conformity with Singh and Tripathi, 2007 findings in which dry weight of weeds increased significantly with the increased dose of N upto 160 kg/ha, though the differences between two successive levels were not significant in direct seeded rice.

Effect on weed

In respect of weed population and dry weight, 120 kg N/ha recorded the lowest weed count and weed dry weight and was also found significantly superior to rest of the nitrogen levels. This might be due to increased availability of nitrogen in soil at higher doses. These results are in agreement with Singh and Tripathi (2007). While in case of weed management practices, the lowest weed count, weed dry weight and highest weed control efficiency were recorded by weed free condition (2 hand weeding at 20 and 40 DAS). Among herbicidal treatments, the lowest weed count, weed dry weight and highest weed control efficiency were recorded by Pendimethalin @ 1 kg/ha *fb* Bispyribac sodium @ 25 g/ha + Pyrazosulfuron @ 25 g/ha and was significantly superior to other herbicidal treatments. Effective suppression of

weed growth at early stages by pre-emergence application of Pendimethalin *fb* post emergence application of herbicide at later stages of crop growth might have reduced weed population and finally their dry weight. These results are in conformity with Jayadeva *et al.,* (2011). The highest weed control efficiency was found to be of pre-emergence application of Pendimetalin *fb* post-emergence application of Pyrazosulfuron + Bispyribac sodium excluding weed free condition (2 HW at 20 and 40 DAS) which was superior in all cases. However, lowest weed index was obtained in the same trend as above. The reason attributed is the better growth of rice crop with more yield attributes and yield at higher doses, hence less loss due to weeds despite of their luxuriant growth. Lower weed index denotes here the less yield losses due to weed in these treatments. These results are in conformity with Saha *et al.,* (2005) and Ramesh *et al.,* (2009) (Table 1).

Effect on yield attributes and yield

In the present investigation number of panicles/mrow length, number of spikelet per panicle, number of fertile spikelet per panicle and 1000-grain weight were the four yield attributes studied. The plots with 160 kg N/ha had significantly the best expression in term of all the four yield attributes. The treatment next in order was comprised of 140 kg N/ha. The treatment with 160 kg N/ha had the maximum panicles/mrow length (71.41) maximum number of spikelet/panicle (140), maximum number of fertile spikelet per panicle (121) and the heaviest test weight (1000-grain weight of 24.65 g). Commensurating with the performances in terms of yield attributes, both grain yield and straw yield too were the maximum (36.22 and 48.03 q/ha) under treatment having 160 kg N/ha. However, the yields (grain and straw) obtained under 140 kg N/ha fared equally well with regard to yield parameters establishing parity with 160 kg N/ha. Among the weed management practices, weed free conditions and combination of pre and post emergence herbicide application outclassed rest of the herbicidal treatments.

The results obtained may be explained on the basis of weed population, their dry matter accumulation at one hand and availability of space to each plant for their growth and development. The yield and yield attributes got their better expression under the condition of less competition, and comparatively better availability of inputs involved in manufacture of building blocks for plant bodies. Simply one fact may be added here that the yield and yield attributes are more prone to weed competition than growth parameters as the growing meristematic tissues in rice plants remains below the ground level for greater part of vegetative growth.

Whereas, the growing point in rice comes above the ground level and face more severe competition with weeds when yield attributes form in the plant body (Evans, 1979). The results with regard to yield attributes and yield having developed under the influence of different nitrogen levels are in close conformity with the results reported earlier from Thimmegowda *et al.,* (2009) (Table 2).

Economics

Quite in league with the performances as regards growth and development, the treatment comprised of 160 kg N/ha out classed the other two treatments in respect of gross return, net return as well as B: C ratio. The above mentioned treatment earned a net return of 31,645/ha with a B: C ratio of1.09. As against this, the treatment with 140 kg N/ha fetched a net return of 27,989/ha concerning a B: C ratio of 0.97. These two nitrogen levels were superior to 120 kg N/ha which realized a net return of 23,927/ha having a B: C ratio of 0.84.

Table.1 Effect of different treatments on weed population and weed dry weight at 30 and 60 DAS

Treatments	Weed population/m^2		Weed dry weight/ m^2		WCE at 60 DAS	Weed index
	30 DAS	60 DAS	30 DAS	60DAS		
Nitrogen levels						
N_1 -120 kg N/ha	12.97(167.6)*	11.12 (123.1)	27.36 (748.1)*	24.91(620.2)	-	-
N_2 -140kg N/ha	16.73 (279.3)	14.58 (212.0)	35.83 (1283.5)	33.00 (1088.2)	-	-
N_3 -160kg N/ha	19.73 (388.9)	17.21 (295.8)	42.98 (1846.8)	39.44 (1554.6)	-	-
SEm±	0.15	0.15	0.10	0.32	-	-
CD (P=0.05)	0.59	0.61	0.40	1.28	-	-
Weed management						
W_1 - Pyrazosulfuron @ 25 g/ha (20 DAS)	18.40 (338.1)	15.44 (237.8)	40.76 (1660.6)	37.27 (1388.6)	40.40	17.92
W_2 -Bispyribac sodium @ 25 g/ha (20 DAS)	15.67 (245.1)	12.81 (163.5)	33.54 (1124.2)	30.34 (920.0)	51.48	10.58
W_3 -Pyrazosulfuron @25 g + Bispyribac sodium @ 25g (tank mix) (20 DAS)	12.99 (168.3)	10.71 (114.3)	27.89 (777.2)	25.12 (630.4)	59.83	6.82
W_4 - Pendimethalin @1000 g/ha (PE) *fb* W_3	10.96 (119.6)	8.90 (78.8)	23.60 (556.5)	21.18 (448.1)	66.13	4.01
W_5 - Weed free (2 Hand weeding at 20 and 40 DAS)	9.26 (85.3)	7.89 (61.8)	20.28 (410.9)	18.25 (332.6)	70.81	-
W_6 - Weedy check	31.56 (995.7)	30.06 (903.3)	66.28 (4392.9)	62.53 (3909.5)	-	41.21
SEm±	0.28	0.30	0.20	0.44	-	-
CD (P=0.05)	0.82	0.88	0.58	1.28	-	-
Interaction (NXW)	NS	NS	NS	NS	-	-

Table.2 Effect of different treatments on yield attributes, yield and economics

Treatments	No of panicles/m row length	No of spikelet/panicle	No. of fertile grains/ panicle	1000-grain weight	Grain yield (t/ha)	Straw yield (t/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
Main plot: Nitrogen levels									
N_1 : 120 Kg N/ha	61.45	127	113	23.72	31.30	41.13	52,360	23,927	0.84
N_2 : 140 Kg N/ha	67.68	133	117	24.14	33.95	44.25	56,720	27,989	0.97
N_3: 160 Kg N/ha	71.41	140	121	24.65	36.22	48.03	60,672	31,645	1.09
S. Em±	1.24	0.45	0.50	0.25	0.65	0.48	855	855	0.03
CD (P=0.05)	5.01	2	2	NS	2.64	1.92	3446	3446	0.12
Sub plot: Weed management									
W_1 -Pyrazosulfuron @ 25 g/ha (20 DAS)	62.14	135	116	23.68	32.07	41.47	53507	27789	1.08
W_2 -Bispyribac sodium @ 25 g/ha (20 DAS)	69.33	137	120	24.01	34.93	44.67	58189	32446	1.26
W_3-Pyrazosulfuron @25 g + Bispyribac sodium @ 25g (tank mix) (20 DAS)	72.02	140	122	24.44	36.40	46.77	60677	34059	1.28
W_4 - Pendimethalin @1000 g/ha (PE) *fb* W_3	76.14	143	124	24.70	37.50	48.73	62622	34338	1.21
W_5 - Weed free (2 Hand weeding at 20 and 40 DAS)	78.22	146	126	24.85	39.07	50.97	65277	24106	0.59
W_6 - Weedy check	43.22	98	93	23.33	22.97	34.23	39230	14386	0.58
SEm±	0.67	0.80	0.71	0.31	0.67	0.70	945	945	0.03
CD (P=0.05)	1.95	2	2	0.89	1.95	2.04	2741	2741	0.10
Interaction(NXW)	NS	NS	NS	NS	NS	NS	NS	NS	NS

The treatment with 160 kg N/ha, however, was adjudged comparable to the treatment with 140 kg N/ha, but was significantly superior to 120 kg N/ha with regard to gross return, net return and B: C ratio. The findings of this investigation as regards economic aspects are quite in agreement with those reported by Devi and Sumathi (2011).

Gross return as well as net return were the maximum under the application of Pendimethalin *fb* Bispyribac sodium + Pyrazosulfuron (W_4), which were in a very close range with all herbicidal applications in cases of net return and gross returns except in case of HW twice at 20 and 40 DAS (W_5) in regard to gross return where the later was maximum. Quite interestingly 2 hand weeding (W_5), which remained comparable with Pendimethalin *fb* Bispyribac sodium + Pyrazosulfuron (W_4) in all the observations pertaining to yield attributes and economic yields fell far behind in terms of net return. As regards Benefit: Cost ratio, 2 HW at 20 and 40 DAS was far behind in comparison with all the herbicidal treatments (W_1 to W_4). It was equally important to make a note that all the herbicidal applications either as sole post-emergence application (W_1 and W_2) or in combination with themselves (W_3) or with pre-emergence Pendimethalin application (W_4) were statistically alike both in terms of net return and B: C ratio.

Manual weeding (2 HW) is still the most effective means to manage weeds in most of the crops, but ever increasing efficacy of newly evolved herbicides and still faster increase in labour cost is making manual weeding a less desirable option. Quite in league with numerous experimental results, 2 hand weeding still found top position as regards growth, development and yield in this investigation also. However, in spite of good yield it fell far behind on economic front. Gross return is primarily a function of economic yield but economics is an interplay of cost involved in application of weed managing treatments. Two hand weeding, on moderate calculations costs around 30 to 40 thousand per hectare. But, no herbicide is as costly as manual weeding.

The results obtained in terms of economics also find support with the works of Singh and Kumar (2002), Sanjay *et al.,* (2008), Pandey *et al.,* (2009) and Singh and Singh (2010).

An experiment under split plot design replicated thrice, was conducted at University Research Farm of Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar during rainy season of 2016 to study the "Effect of weed management and nitrogen on weed dynamics and yield of rice under aerobic condition". All herbicidal combinations had heavier grains than their sole (post-emergence alone) applications.

Two hand weeding had the best expression in terms of number of panicles per meterrow length, number of grains per panicle and number of fertile grains per panicle. Pendimethalin @ 1 kg/ha *fb* Bispyribac sodium @ 25 g/ha + Pyrazosulfuron @ 25 g/ha remained close to this treatment in all the observations. So, it may be concluded that weeds can be managed during critical period of competition with sequential application of herbicides alone and their proper combination i.e. Pendimethalin @ 1 kg/ha *fb* Bispyribac sodium @ 25 g/ha + Pyrazosulfuron @ 25 g/ha in rice under aerobic condition.

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References

Azmi, M. and Baki, B. 2007. Weed flora landscapes and innovative management in direct seeded culture. Science, technology and trade for peace and prosperity. In: *Proceedings of the 26th International Rice Research Conference*, 9-12 October, 2006, New Delhi, India. pp. 401-09.

Bhusan, L., Ladha, L. K. Gupta, R.K., Singh, S., Tirol Padre, A., Saharawat, Y.S., Gathala, M., Pathak, H. 2007. Saving of water and labor in rice-wheat with no tillage and direct seeding technologies. *Agron.J*. 99, 1288-1296.

Bouman, B. A.M., Peng, S., Castaneda, A. R. and Visperas, R.M. 2005. Yield and water use of irrigated tropical aerobic rice systems. Agril. Water Management 74: 87-105.

Chauhan, B.S. and Seth, A.B. 2013. Weed management in mechanized-sown, zero-till dry seeded rice. http.//.doc.org/ 10.1614/wt-D-12-0088.1

De Datta, S.K. and R.J. Buresh, 1989. Integrated nitrogen management in irrigated rice. Adv. Agron., 10: 143–169.

Devi, G. and Sumathi, V. 2011. Effect of nitrogen management on growth, yield and quality of scented rice under aerobic conditions. *Journal Research* ANGRAU. 39(3): 81-83.

Evans, L.T., Wardlaw, I.F. and Fischer, R.A. 1979. *Wheat crop physiology*. Blackie and Sons Publishers Pvt. Ltd., Bombay, pp. 101-135.

IWMI 2000. *Comprehensive assessment of water management in agriculture* Research report 2.

Jayadeva, H.M., Bhairappanavar, S.T., Hugar, A.Y., Rangaswamy, B.R., Mallikarjuna, G.B., Malleshappa, C. and Naik, D.C. 2011. Integrated weed management in aerobic rice (*Oryza sativa* L.). *Agricultural Science Digest*. 31(1): 58-61.8.

Khaliq, A.M., Ahmad, N., Rasul, A. and Awan, I.U. 2012. Post emergence chemical weed control in Direct seeded fine rice. *The journal of animal and Plant sciences* 22(4): 1101-1106.

Maity, S.K. and Mukherjee, P.K. 2008. Integrated weed management in dry direct seeded rainy season rice *(Oryza sativa). Indian Journal of Agronomy* 53 (2): 116-120.

Mishra, J.S. and Singh, V.P. 2011. Cultivar competitiveness and weed control in zero-till dry seeded irrigated rice (*Oryza sativa*). *Indian Journal of Agricultural Sciences* 81(10): 976-78.

Pandey, D. K., Gangwar, K. S. and Chaudhary, V. P. 2009. Weed management in direct sown rice. *Oryza* 46(2): 165-166.

Ramesh, T., Sathiya, K., Padmanaban, P.K. and Martin, J.M. 2009. Optimization of nitrogen and suitable weed management practice for aerobic rice. *Madras Agricultural Journal.* 96(7-12): 344-348.

Rao, A. N., Jounshon, D. E., Prasad. B., Ladh, J.K. and Mortimer, A. M. 2007. Weed management in direct seeded rice *Advance in Agronomy* 93: 153-255.

Saha, S., Dani, R.C. Patra, B.C. and Moorthy, B.T.S. 2005. Performance of different weed management techniques under rainfed rice production system. *Oryza* 42(4): 287-289

Sanjay, M.T., Setty, L.K., Prabhakara and Nanjappa, H.V. 2008. Investigation of crop establishment methods and weed management practices on productivity and economics in rice. *Mysore Journal of Agriculture Science* 42(1): 60-66.

Singh, K and Tripathi, H.P. 2007. Effect of nitrogen and weed control practices on performance of irrigated direct seeded

rice (*Oryza sativa*). *Indian Journal of Agronomy* 52(3): 231-234.

Singh, M and Singh, R.P. 2010. Influence of crop establishment method and weed management practices on yield and economics of direct seeded rice. *Indian Journal of Agronomy* 55(3): 224-229.

Singh, R. Singh, M. K. and Kumar, S. 2002. Weed management in rice. *Farmers Digest*, PP. 5 -12.

Thimmegowda, P., Govindappa, M., Kalyana Murthy, K.N., Shankaraiah, C. and Jnanesh, A.C. 2009. Effect of herbicides and cultural treatment on uptake of major nutrients by crop and weeds under aerobic rice cultivation. *Journal of crop and weeds* 5(1): 327-330.

Tuong, T.P and Bouman, B.A.M. 2003. Rice production in water scarce environments to be published in proceedings of the water productivity workshop, 12-14 Nov. 2001, International Water Management Institute, Srilanka.

Wang, H.Q., Bouman, B.A.M., Zhao, D. L., Wang, C., Moya, P. F., 2002. Aerobic rice in northern China: opportunities and challenges. Proceedings of the International Workshop on Water-wise Rice Production, 8-11 April 2002, Los Banos Philippines. International Rice Research Institute, Los Banos, Philippines, pp. 143-154.

Zhang, L., Lin, S., Bouman, B.A.M., Xue, C., Wei, F., Tao, H., Yang, H., Wang, D.Z. and Dittert, K. 2009. Response of aerobic rice growth and grain yield to N fertilizer at two contrasting sites near Beijing. China *Field Crops. Research* 114: 45-53.

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