EFFECTIVENESS OF PLANT GROWTH REGULATOR "HUMIC KT" TO STIMULATE MORE RICE ROOTS AT SEEDING STAGE

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ABSTRACT

The study was carried out in laboratory of Agronomy department, Cuu Long Delta Rice Research Institute during 2012 wet season. Humic acid was extracted from soil compost of rice straw. Solution of humic acid KT was combined with IAA 100ppm.The first experiment was designed with five treatments and three replications. All the treatments were laid out with humic dose ranging in T1: control, T2: 2%, T3: 4%, T4: 5% and T5: 10%. This experiment determined how humic acid enhances rice root development. The second experiment was designed with five treatments and three replications. Humic acid doses were ranged as T1: control, T2: 1%, T3: 2%, T4: 3% and T5: Comcat (recommended dose). This second experiment was compared to Comcat. Comcat, a plant growth regulator is popularly commercialized. Our results showed that number of root and root length were higher than other treatments at 7 and 14 days after sowing in treatment of Humic KT at 2% dose Moreover, humic KT at 2% dose also gave higher number roots and shoot fresh weight as compared to Comcat.

***Keywords**: humic KT, IAA, plant growth regulator, rice roots, Comcat.*

INTRODUCTION

The plant growth regulators (PGR) are intensively and extensively applied for agriculture production, and played a vital role in the growth and development of plants. Along with the development of intensive cultivation of fruits, the application of PGR for controlling the growth of fruits has been progressively paid more attention (Ma, 1998). As for concentration of micro-nutrients, the data indicate that the concentration of Fe, Zn, and Mn is increased in all treatments as compared with the control. Application of aminofert at 0.25% + 20 ppm of GA3 is more effective compared with other treatments in two seasons (Hassan *et al*., 2010). Ravetta and Palzkill (1992) determined that after using growth regulators on jojoba plants during the first 3 years of growth, it significantly increases branching and flower bud production with some variation in clone responses. The effect of GA3 has at least three important actions, the first is intensify the ability of organ to be as a nutrient sink; second is increase the synthesis of IAA in plant tissues and the third, it involves synthesis acceleration of hydrolytic enzymes in aleurone cells (Addicott and Addicott 1982). Grewal and Gill (1986) reported that in a field grown paddy (*Oryza sativa* L.), leaf area index of the crop increases with the foliar spray of NAA (100 and 200 mg/l) and nitrogen (0, 60, 90 and 120 kg N/ha). Auxin plays a major role in controlling growth and development of plants, early stages of embryogenesis, organization of apical meristem (phyllotaxy) and branching of the plant aerial parts (apical dominance), formation of main root, lateral and adventitious root initiation (Went and Timann 1937). Auxin is also involved in gravitropism and phototropism (Kepinski and Leyser 2005). Rooting phases, which can be distinguished in various ways, have diferent hormone requirements (de Klerk *et al*., 1999). Rzepka-Plevnes *et al*., (2011) indicated that the addition of humic acid to the medium at rooting stage has a more beneficial influence than auxins on the development of a root system and the mass of produced plants. Subsequent effect of humus on the development of plants at the stage of adaptation to ex vivo conditions are also proved.

MATERIALS AND METHODS

Humic acid combination with plant growth regulator (IAA) was made in laboratory of Agronomy Department, Cuu Long Delta Rice Research Institute. Comcat is a plant growth regulator, it has been used popular by many farmers in Mekong Delta. OM5451 variety was used as a tested variety. Two experiments were conducted in the CLRRI laboratory. Both of experiments were laid out in Random Complete Designed with five treatments and three replications.

The first experiment was designed with five treatments with humic dose ranging as: T1: control, T2: 2%, T3: 4%, T4: 5% and T5: 10%. Plant growth regulator was treated as followed procedure: germinated rice seeds was soaked into ready solution and kept for 30 minutes. After soaking into the solution, the good germinated seeds were put in plastic glass. Each glass was sowed with ten germinated seeds.

Five treatments with humic dose ranging as: T1: control, T2: 1%; T3: 2%; T4: 3% and T5: Comcat (recommended dose) in the second experiments were also designed. Plant growth regulator was treated as the same procedure in the fist experiment

Plant height, root length, number of root / plant and biomass weight of 10 plants were recorded at 7 and 14 days after sowing, in first and second experiments, respectively. All these experiments was not applied chemical fertilizers.

Figure 1. Extracting humic acid from soil compost of rice straw

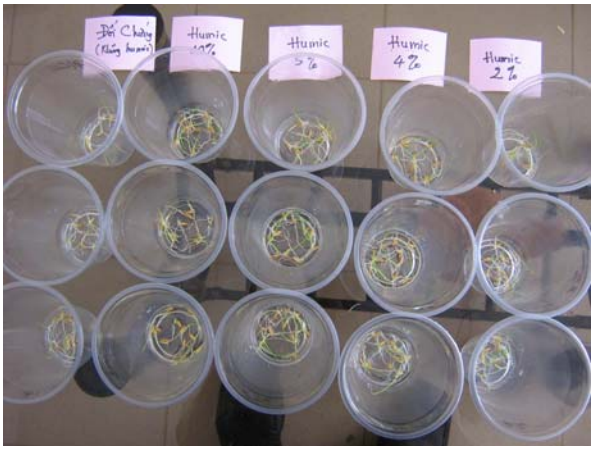

Figure 2. Experiment for selecting the appropriate solution doses of humic KT.

RESULTS AND DISCUSSION

The results showed that application of humic acid with 2, 4 and 5% were significant in terms of higher plant height than control and humic 10%. Similarly, these treatments gave more number of roots per plant compared with control treatment at the 5% significant level. Among these treatments, the treatment with humic 2% obtained the highest number of roots and it also exhibited the highest root length compared with others (Table 1, Fig. 1 and 2). Rzepka-Plevnes *et al*., (2011) indicated that the addition of humic acid to the medium at rooting stage has a more beneficial influence than auxins on the development of a root system and the mass of produced plants. Subsequent effect of humus on the development of plants at the stage of adaptation to *ex vivo* conditions was also proved.

Table 1. Effective of different humic acid and plant growth regulator on the height plant, root number, root length, weight of plants at 7 DAS.

Treatment	Plant heigth (cm)	Root length (cm)	Fresh weight of 10 plants (g)
Control	4.94	3.63	4.76
Humic KT 2%	5.57	4.18	5.13
Humic KT 4%	5.67	3.47	4.60
Humic KT 5%	5.59	3.16	4.80
Humic KT 10%	4.82	3.24	4.73
CV (%)	**6.70**	**9.10**	**3.10**
LSD (5%)	**0.26**	**0.58**	**0.26**

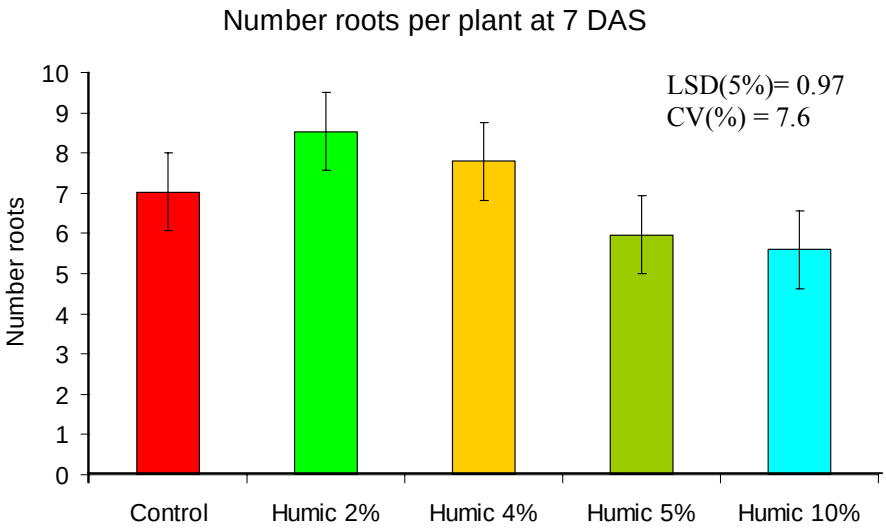

Figure 3. Effectiveness of different treatments on number of roots per plant at 7 DAS.

The highest plant weight was observed at humic 2% treatment as compared with others. The treatment of humic KT 2% well obtained for almost parameters as plant height, root number, root length, and shoot weight as compared to others. The humic 2% is considered as a good solution for simulating rice in case of root development. The humic 5 and 10% treatments decreased plant height, root length, root number per plant.

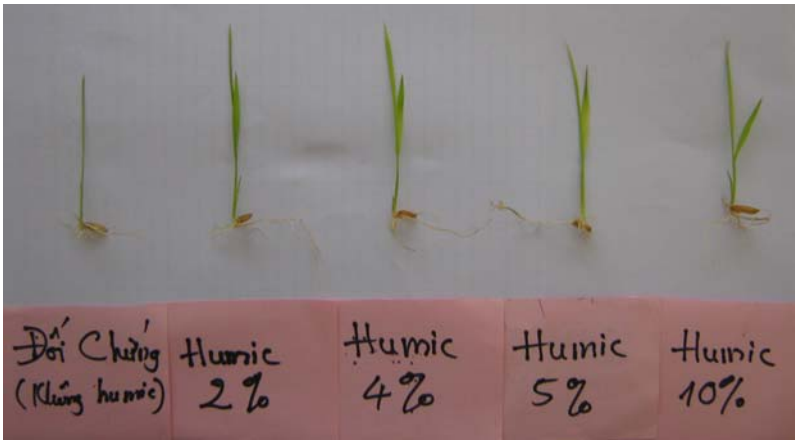

Figure 4. Roots of rice in different treatments of humic acid at 7 DAS.

Auxin plays an important role in controlling growth and development of plants, at early stages of embryogenesis, organization of apical meristem (phyllotaxy) and branching of the plant aerial parts (apical dominance), formation of main root, lateral and adventitious root initiation (Went and Timann 1937). From the first experiment, treatment of humic KT 2% was selected for evaluating and comparing with other plant growth regulator as Comcat, which was commercially applied by many farmers in Mekong Delta. That is why the reason of second experiment was conducted. Table 2 and Fig 3; and 4 show that all treatments of applied solution with humic KT and Comcat offered higher plant height, root number, root length and shoot weight of plant than control. Among treatments, humic 2% was significantly different for all parameters, except plant height compared with Comcat. So the humic KT 2% could be applied to increase root number, root length in the seedling stage of rice.

Table 2. Effectiveness of different plant growth regulator on the plant height, root number, root length, shoot weight at 14 DAS**.**

Treatments	Plant height (cm)	Root length (cm)	Shoot weight 10 plants (g)
Control	11.18	3.57	3.99
Humic KT 1%	11.56	3.71	4.41
Humic KT 2%	11.64	4.52	4.49
Humic KT 3%	11.78	3.88	4.39
Comcat (RD)*	13.66	3.24	4.24
CV(%)	**5.80**	**10.80**	**3.70**
LSD (5%)	**1.25**	**0.74**	**0.28**

**RD: recommended dose.*

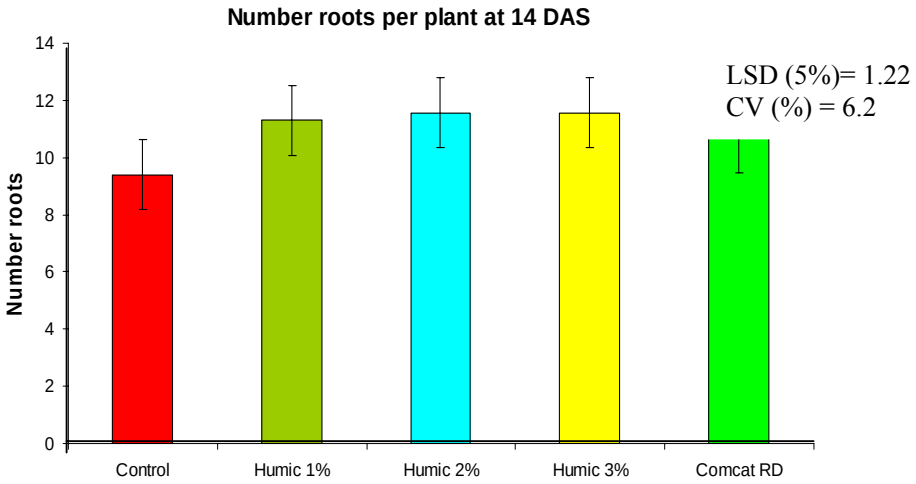

Figure 5. Effectiveness of different doses on root number at 14 DAS.

Figure 6. Root expression on different treatments (Humic KT) and Comcat at 7 DAS.

Figure 7. Rice roots induced by Comcat RD and humic KT at 14 DAS

Both of the experiments showed that "humic acid KT" at 2% dose was the best for simulating rice roots and increasing root number per plant.

CONCLUSION

Solution of plant growth regulator as "humic KT" at 2% dose are the best for simulating the increment of rice root number and shoot weight of rice plant at 7 and 14 DAS.

This plant growth regulator "humic KT" should be continued to be tested in green house, rice field with different rice genotypes.

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ĐÁNH GIÁ ẢNH HƯỞNG CỦA CHẤT KÍCH THÍCH TĂNG TRƯỞNG THỰC VẬT "Humic KT" CHO VIỆC KÍCH THÍCH RA RỄ LÚA Ở GIAI ĐOẠN NẢY MẦM

Nghiên cứu được đánh giá trong phòng thí nghiệm của bộ môn kỹ thuật canh tác, Viện Lúa Đồng bằng sông Cửu Long trong vụ Hè Thu năm 2012. Axít humic được trích từ chất hữu cơ từ rơm rạ hoai mục. Còn dung dịch "Humic KT" là sự kết hợp giữa axít humic với chất kích tố IAA 80 ppm. Thí nghiệm thứ nhất được bố trí theo thể thức hoàn toàn ngẫu nhiên với 5 nghiệm thức và được lập lại 3 lần. Các nghiệm thức được sắp đặt như sau: T1: đối chứng, T2: Humic 2%, T3: humic 4%, T4: humic 5% và T5: humic 10%. Mục đích của thí nghiệm là chọn ra được mức độ Humic KT thích hợp cho sự kích thích ra rễ. Thí nghiệm thứ 2 được bố trí với 5 nghiệm thức và 3 lần lập lại cũng theo thể thức hoàn toàn ngẫu nhiên. Các nghiệm thức được sắp đặt như sau: T1 đối chứng, T2: Humic 1%, T3: humic 2%, T4: humic 3% và T5: Comcat (theo khuyến cáo). Kết quả của cả 2 thí nghiệm đã cho thấy rằng axít humic KT ở nồng độ 2% đã làm gia tăng số rễ, chiều dài rễ trên cây cao hơn các nghiệm thức khác trong thí nghiệm ở cả 7 và 14 ngày sau khi sạ. Thêm vào đó, cũng cho thấy rằng a xít humic KT nồng độ 2% đã làm gia tăng số rễ và trọng lượng tươi của cây lúa cao hơn chất kích thích ra rễ Comcat.