ISSN : 2350-0743

www.ijramr.com

International Journal of Recent Advances in Multidisciplinary Research
Vol. 10, Issue 07, pp. 8598-8603, July, 2023

RESEARCH ARTICLE

EFFECT OF SEED PRIMING TECHNIQUES ON PRODUCTIVITY OF MAIZE HYBRID COH (M)6

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ARTICLE INFO

Article History:
Received 18th April, 2023
Received in revised form
10th May, 2023
Accepted 26th June, 2023
Published online 30th July, 2023

Key words:

Imidachlobrid,
Carbendazim,
Unprimed.

ABSTRACT

Studies were initiated to evaluate the influence of seed priming technique (Humic acid 20%, Carbendazim 2%, Imidachlobrid 3% and hydro priming technique) in conjunction with crop management techniques along with NPK application in Maize COHM 6. Seeds primed with Humic acid 20%, maintained the germination above the seed certification standard with higher seedling quality characters and lesser deteriorative observations compared to unprimed seed of COHM 6. The results revealed that seeds primed with 20 per cent humic acid gives better results in morphological, yield and yield attributing characters of maize COHM 6. On comparison of seed and crop management techniques the contribution of seed management technique was higher than crop management techniques.

INTRODUCTION

Maize botanically known as *Zea mays* L. is a cross pollinated crop of commercial importance and is native of mexico (en.wikipedia.org/wiki/maize). It possesses the unique character of monoecious inflorescence which confers cross pollination. It is crowned as "Queen of Cereals" as it occupies third important global position in cereal crop next to rice and wheat.Paroda and Kumar, (2000) opined that the private and multinational seed companies might be encouraged to strengthen the research and development programmes on evaluation of high yielding varieties and hybrids for enhanced productivity through novel crop management techniques (Widawsky and Toole, 1996). Focused demand of maize crop paves way for the development of several public and private sector hybrids, in which COHM (6) is one of the newly released public sector hybrids of TNAU. Research on seed management techniques with biological inoculants is also warranted in organic farming, the newer vision of old wine in agriculture that emphasizes on soil and human health (www.fao.org). Among the bio products, humic acid (Amal, 2001; Olk *et al.*, 2007), panchakavya (Natarajan, 2002), biofertilizer (Hedge, 2002) and biocontrol agents (Harman *et al.,* 2004) are attracting the growers owing to their negligible negative effects and their coordinated relation with plant kingdom.

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Application of humic acid is found to be useful in seed (Revel *et al.,* 1999), soil (Muscola *et al.,*1999) and crop management techniques, leading to improved productivity (Delfine *et al.,* 2004). Nutrients are also recommended for crops (Anon, 2005) as additives at reproductive stage for improvement in seed set and productivity (Gel *et al.,* 1999). Humic acid is an organic substance derived from a coal oxidation process and is claimed for improvement in productivity of agricultural crops and also recommended in seed, soil and crop management techniques (Quaggiotti *et al.,*2004; Tejeda and Gonzales, 2006). Commercial products of humic and fulvic acids are available internationally and are recommended for crop management in organic farming. Application of humic acid as priming agent was effective in greengram (Pushpa *et al*., 2002), cotton (Saravanan *et al*., 2002), wheat (Patil *et al*., 2010; Killi, 2004), maize (Tan and Nopamornbodi, 1979), soybean (Patil and Wadje, 2011), blackgram (Patil and Wadje, 2011), peanut and clover (Tan and Tantiwiramanond, 1983), rye grass (Asenjo*et al*., 2000), *Chenopodium album* (Sera and Novak, 2011), tomato (Turkmen *et al*., 2004; Cimrin*et al*., 2010), geranium and Marigold (Hartwigsen and Evans, 2000).

METHODS AND MATERIALS

Bulk seeds of maize COH (M) 6 hybrid was obtained from authenticate source and were primed withCarbendazim 2%, Imidachlobrid 3%and humic acid 20 % ambient conditions of coimbatore (11°1′6″N, 76°58′21″E) adoptingthe seed to solution ratio of 1:1 and the soaking duration of 8 h.

The primedseedsweredried back to 8 per cent moisturealong with unprimmedand hydroprimed seeds as above using water as priming agent. The experimental design adopted was factorial RBDwith three replications.. The germination (%) was evaluated as per Anon, (2007). Based on the germination and vigour index values as per Abdulbaki and Anderson, (1973) were computed.

Experiment: Effect of seed treatments and foliar applications on plant population, growth, yield attributes and yield.

Variety: COHM 6
No. of treatments: 5
No. of Replications: 3
Design: RBD
Area: 5 cents

Treatments:

T1: Control
T2: Hydro priming
T3: Humic acid 20%
T4: Carbendazim 2%
T5: Imidachlobrid 3%

The humic acid was obtained from Neyveli lignite corporation, while the seed weed extract used was the commercial product (Agromin)The crop raised with the above treatmental schedule were evaluated for the yield and yield attributing characters viz., cob weight plant^{-1} (g), kernel yield plant^{-1} (g) and kernel /grain yield plot^{-1}(kg), which was computed to grain yield per hectare. The data were statistically scrutinized as per Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Seed priming is a pre sowing seed management technique claimed to overcome soil moisture stress, germination inhibitors, quenche free radical, get rid of pathogens during initial stages of seedling establishment and result in enhanced germination, growth rate of seedling, uniform plant growth and flowering that extends up to productivity and the resultant product quality. Heydecker, (1972) explored the activation of germination metabolism, biochemical, physiological mechanisms of stress tolerance, that remain inactive even under optimal environmental conditions due to seed priming. The seeds primed with 20 per cent humic acid recorded maximum values for germination (98 %), shoot length (15.6 cm), root length (29.5 cm) and vigour index (4420) and minimum values of germination (90 %), shoot length (11.9 cm), root length (22.3 cm) and vigour index (3078) recorded with control. Humic acid increase the germination, root length, shoot length, dry matter production and vigour index respectively. The invigourative action might be due to the increased cell membrane permeability, oxygen uptake, respiration, photosynthesis, phosphate uptake, stimulation of shoot and root growth, and root number as reported by Mylonas and Mccants, (1980), while due to root cell elongation, stimulation of shoot and root growth, and improved resistance to environmental stresses as per the views of Cimrin and Yilmaz, (2005) and Yildirim, (2007). Similar germination improvement was also reported in wheat (Patil et al., 2010) and maize (Olket al., 2007). Sera and Novak, (2011) also observed germination stimulation in Chenopodium aldum due to humic acid. Stimulatory effects were also reported by Asenjo et al. (2000), and Loffredo *et al*., (2005) in shortening the period of germination.

Table 1: Influence of seed treatment on germination percentage, Root length (cm), Shoot length (cm) and vigour index of Maize CO(H)M 6

Treatments	Germination percentage	Root length (cm)	Shoot length (cm)	Vigour index
T1 – control	90 (71.57)	22.3	11.9	3078
T2 – Hydro priming	92 (73.57)	25.2	13.1	3524
T3 – Humic acid 20%	98 (81.87)	29.5	15.6	4420
T4 – Carbendazim2%	94 (75.82)	27.9	14.6	3995
T5 – Imidachlobrid 3%	95 (73.57)	28.2	14.9	4095
Mean	94 (75.82)	26.62	14.02	3822
SEd	0.74	0.14	0.09	6.85
CD	1.57	0.28	0.17	13.45*

*significant at 1% level, *significant at 5% level

Table 2. Influence of seed treatment on field emergence, plant height, leaf length of Maize CO (H)M 6

Treatments	Field emergence	plant height (cm) at 30 DAS	plant height (cm) at 60 DAS	leaf length (cm)at 30 DAS	leaf length (cm) at 60 days
T1 – control	82(64.90)	75.3	138.4	38.8	56.1
T2 – Hydro priming	83(65.65)	76.8	143.1	38.6	57.6
T3 – Humic acid 20%	92(73.57)	85.8	159.5	46.1	65.9
T4 – Carbendazim2%	87(68.87)	80.8	149.6	42.1	61.1
T5– Imidachlobrid 3%	90(71.57)	84.7	153.2	45.8	65.5
Mean	87(68.87)	80.7	148.8	42.3	61.3
SEd	0.68	1.26	1.52	1.32	1.35
CD	1.36**	2.52**	3.04**	2.63**	2.71**

*significant at 1% level, *significant at 5% level

Table 3. Influence of seed treatment on leaf breadth, Chlorophyll content of Maize CO(H)M 6

Treatments	leaf breadth (cm) at 30 DAS	leaf breadth (cm) at 60 DAS	Chlorophyll content (per unit leaf area) at 30 DAS	Chlorophyll content (per unit leaf area) at 60 DAS
T1 – control	6.2	8.1	35.2	37.4
T2 – Hydro priming	6.5	8.2	38.0	38.8
T3 – Humic acid 20%	6.8	9.4	41.4	42.7
T4 – Carbendazim2%	6.6	8.6	39.2	39.5
T5 – Imidachlobrid 3%	6.5	9.0	40.5	41.4
Mean	6.5	8.7	38.9	39.9
SEd	0.21	0.42	1.12	1.19
CD	0.43**	0.84*	2.24*	2.38 **

*significant at 1% level, *significant at 5% level

Table 4. Influence of seed treatment on 50% tasseling, 50% silking, cob length, cob breadth of Maize CO(H)M 6

Treatments	50% tasseling	50% silking	cob length (cm)	cob breadth (cm)
T1 – control	57	62	14.6	6.1
T2 – Hydro priming	57	62	14.9	6.5
T3 – Humic acid 20%	56	61	16.1	8.3
T4 – Carbendazim2%	56	61	15.5	7
T5 – Imidachlobrid 3%	56	61	15.8	7.4
Mean	56	61	15.4	7
SEd	1.23	1.42	0.43	0.24
CD	2.46	2.84	0.87**	0.47**

*significant at 1% level, *significant at 5% level

Table 5. Influence of seed treatment on cob weight plant^{-1} (g), grains cob^{-1}, grain yield per plant (g), grain recovery (%)of Maize CO(H)M 6

Treatments	cob weight plant^{-1} (g)	grains cob^{-1}	grain yield per plant (g)	**grain recovery (%)**
T1 – control	94.7	167	43.9	52(46.15)
T2 – Hydro priming	95.6	178	46.6	54(47.30)
T3 – Humic acid 20%	100.2	217	59.9	65(53.73)
T4 – Carbendazim2%	98.8	191	51.6	59(50.18)
T5 – Imidachlobrid 3%	99.6	204	55.5	61(51.36)
Mean	97.8	191	51.5	58(49.61)
SEd	1.97	7.98	1.04	1.39
CD	3.96**	15.97**	2.08**	2.78**

*significant at 1% level, *significant at 5% level

Table 6. Influence of seed treatment on 100 grain weight (g), Grain plot yield (kg), Grain yield per ha^{-1} (Kg) of Maize CO(H)M 6

Treatments	100 grain weight (g)	Grain plot yield (kg)	Grain yield per ha^{-1} (Kg)
T1 – control	26.6	2.34	6512
T2 – Hydro priming	26.5	2.35	6682
T3 – Humic acid 20%	28.3	2.61	7259
T4 – Carbendazim2%	27.3	2.50	6921
T5 – Imidachlobrid 3%	27.6	2.55	7041
Mean	27.3	2.47	6883
SEd	0.19	0.04	88.43
CD	0.39**	0.07**	177.03**

*significant at 1% level, *significant at 5% level

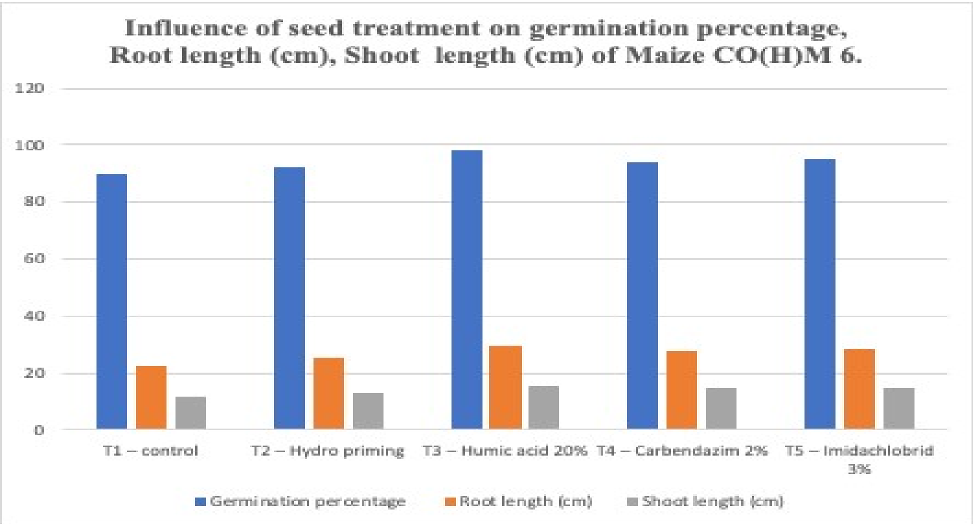

Fig. 1. Influence of seed treatment on germination percentage, Root length (cm), Shoot length (cm) of Maize CO(H)M 6.

The results indicated that seeds primed with humic acid 20% hike in growth characters were more infield emergence (92 %), plant height (85.8cm) at 30 DAS, plant height (159.5cm) at 60 DAS, leaf length (46.1cm) at 30 DAS, leaf length (65.9cm) at 60 DAS leaf breadth (6.8cm) at 30 DAS, leaf breadth (9.4cm) at 60 DAS. The lowest values recorded in field emergence (82 %), plant height (75.3cm) at 30 DAS, plant height (138.4cm) at 60 DAS, leaf length (38.8cm)at 30 DAS, leaf length (56.1cm) at 60 DAS, leaf breadth (6.2cm) at 30 DAS, leaf breadth (8.1 cm) at 60 DAS with control.

Humic acid is applied as seed or soil or crop nutrient in agriculture (Quaggiotti *et al.,* 2004). Humic and fulvic acids constitute 65 to 70 per cent of the organic matter in soils (Russo and Berlyn, 1990), and are the subject of study in various areas of agriculture, as the multiple roles played by these materials are widely beneficial for enhanced plant growth (Turkmen *et al.,* 2004; Brunetti *et al.,*2005; Nardi *et al.,* 2002; Serenella *et al.,*2002; Quaggiotti *et al.,* 2004). Seed primed with Humicacid 20% give better results in Chlorophyll content (41.4per unit leaf area) at 30 DAS, Chlorophyll content

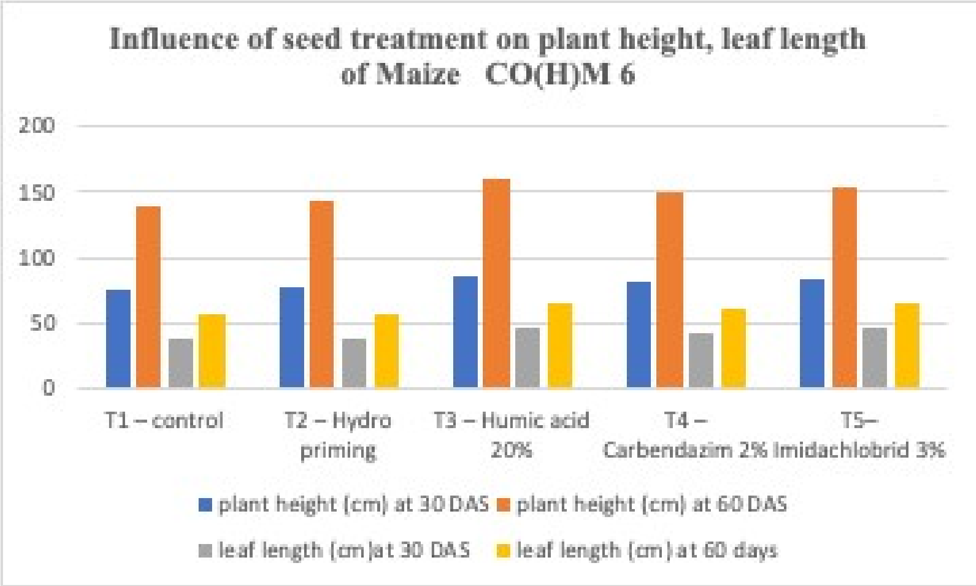

Fig 2. Influence of seed treatment on plant height, leaf length of Maize CO(H)M 6

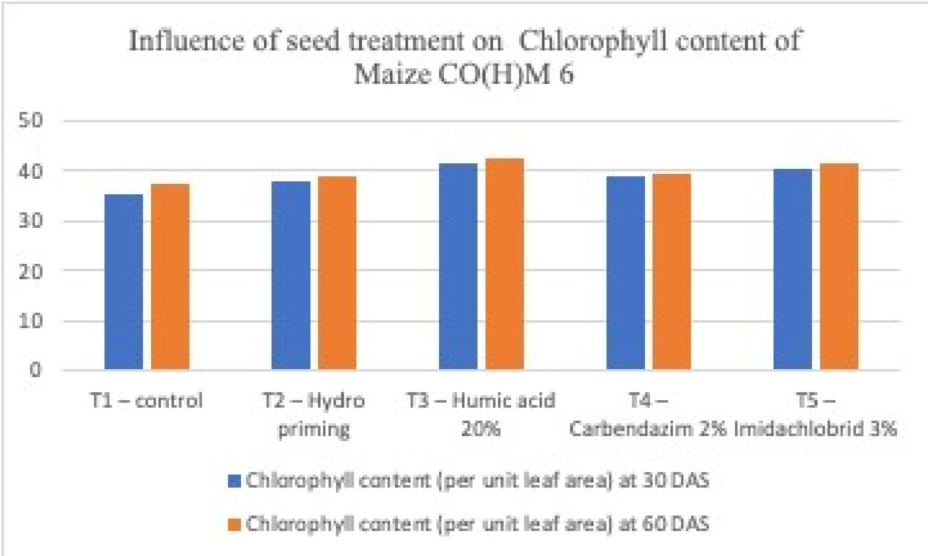

Fig 3. Influence of seed treatment on Chlorophyll content of Maize CO(H)M 6

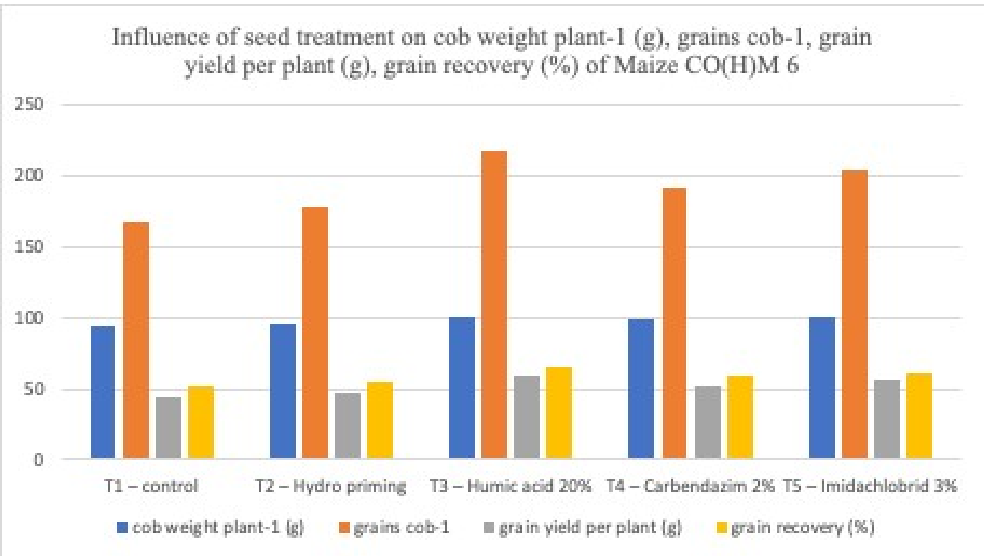

Fig 4. Influence of seed treatment on cob weight plant-1 (g), grains cob-1, grain yield per plant (g), grain recovery (%) of Maize CO(H)M 6

(42.7per unit leaf area) at 60 DAS and also recorded earliest 50% tasseling (56 DAS), 50% silking (61 DAS). The lowest values of Chlorophyll content (35.2per unit leaf area) at 30 DAS, Chlorophyll content (37.4 per unit leaf area) at 60 DAS and also recorded longest 50% tasseling (57 DAS), 50% silking (62 DAS) recorded with control.

The study also highlighted that within the stages, the hike was in decreasing order for plant height and leaf length but the leaf breadth was the lowest at vegetative phaseand higher with flowering and maturation phase. While the yield attributing characters such as cob length (16.1 cm), cob breadth (8.3 cm), cob weight plant^{-1}(100.2 g), grainyield plant^{-1}(59.9 g), grains cob^{-1}(217), 100 seed weight (28.3 g) , seed recovery (65 % (53.73), grain yield plot $^{-1}$(2.61 kg) and grain yield ha^{-1} (7259) recorded the highest values with seeds primed withhumic acid 20 %. Than the lowest values cob length (14.6 cm), cob breadth (6.1 cm), cob weight plant^{-1}(94.7 g), grainyield plant^{-1}(43.9 g), grains cob^{-1}(167), 100 seed weight (26.6 g) , seed recovery (52(46.15)), grain yield plot $^{-1}$(2.34 kg) and grain yield ha^{-1} (6512) recorded with control Amutha *et al*., (2008) also observed similar results in *Cyamopsis tetragonoloba* L. Taub and expressed the synergistic influence of humic acid as cause for the improved yield due to invigourative growth promotive action. Thus the study on COH (M) 6 maize hybrid revealed that primed seed (20 per cent humic acid) invigourative and nutritive advantages and improved the productivity by improving the yield attributing characters .

REFERENCES

Abdul-Baki, A. A. and J. D. Anderson. 1973. Vigour determination of soybean seeds by multiple criteria. Crop Sci., 13: 630-633.

Amal, D. A. 2001. Effect of humic acid treatments on growth and development of groundnut under different fertilizer levels. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Amutha, M., R. Sobithabai and R. A. S. Kumar. 2008. Effect of seagrass liquid fertilizer on germination and linear growth in *Cyamopsis tetragonoloba* L. Taub. Seaweed Res. Utiln., 30: 249-253.

Anon, 2005. Crop production guide. Dept of agriculture, Govt. of Tamil Nadu, Chennai and Tamil Nadu Agricultural University, Coimbatore.

Anon, 2007. International Rules for Seed Testing. Seed Sci. & Technol., Supplement Rules, 5: 1-50; 10: 1-2.

Asenjo, M. C. G., J. L. Gonzalez and J. M. Maldonado. 2000. Influence of humic extracts on germination and growth of ryegrass. Commun. Soil Sci. Plant. Anal., 31: 101–114

Asenjo, M. C. G., J. L. Gonzalez and J. M. Maldonado. 2000. Influence of humic extracts on germination and growth of ryegrass. Commun. Soil Sci. Plant. Anal., 31: 101–114

Brunetti, G., C. Plaza and N. Seneri. 2005. Olive pomace amendment in Mediterranean conditions: Effect on soil and humic acid properties and wheat (Triticum turgidum) yield. J. Agric. Food Chem., 53 (17): 6730-6737.

Cimrin, K. M., and D. Yilmaz. 2005. Humic acid applications to lettuce do not improve yield but do improve phosphorus availability. Section B-Soil and Plant Sci., 55:58–63.

Cimrin, K. M., O. Turkmen, M. Turan and B.Tuncer. 2010. Phosphorus and humic acid application alleviate salinity stress of pepper seedling. African J. Biotech., 9(36): 5848-5851

Delfine, S., R. Tognetti, E. Desiderio and A. Alvino, 2005. Effect of foliar application of N and humic acids on growth and yield of durum wheat. Agron. Sustain. Dev., 25: 183-191.

Gel, G. P., J. H. Gao and Y. C. Zhao. 1999. Initial report on B and Mo increasing alfalfa seed yield. Animal Sci. Veteri. Med., 1:17.

Hartwigsen J. A. and M. R. Evans. 2000. Humic acid seed and substrate treatments promote seedling root development. Hort. Sci., 35: 1231–1233.

Hedge, S. V. 2002. Liquid biofertilizers in Indian agriculture. Biofert. NewsLett., 12: 17-22.

Heydecker, W. 1973. Germination of an idea: The priming of seeds. University of Nottingham School of Agri. Rep., 1973 - 74.

Killi, F. 2004. Effects of potassium humate solution and soaking periods on germination characteristics of undelinted cotton seeds (*Gossypium hirsutum*). J. Environ. Biol., 25: 395–398

Muscola, A., F. Bavolo, F. Gionfriddo and S. Nardi. 1999. Earthwarmhumic matter produced auxin-like effectonDaucuscarota cell and nitrate metabolism. Soil Biol. Biochem., 31: 1303–1311.

Mylonas, V. A., and C. B. Mccants. 1980. Effects of humic and fulvic acids on growth of tobacco. 1. Root initiation and elongation. Plant Soil, 54: 485-490.

Nardi, S., D. Pizzeghello, A. Muscolo and A. Vianello. 2002. Physiological effects of humic substances on higher plants. Soil Biol. Biochem., 34: 1527–1536.

Natarajan, K. 2002. Panchakavya. A manual. Other India Press, Mapusa, Goa, India p.33.

Olk.D. C., M. I. Samson and P. Gapas. 2007. Inhibition of nitrogen mineralization in young humic fractions by anaerobic decomposition of rice crop residues. European J. Soil Sci., 58(1): 270–281.

Paroda, R. S., and P. Kumar. 2000. Food production and demandin. South Asia. Agric, Eco. Res., 13(1):1-25.

Patil, R. B. and S. S.Wadje. 2011. Effect of potassium humate and deproteinised juice on seed germination and growth of *Glycine max* and *Phaseolus mungo*. Bioscience Dis., 2(1): 72-75.

Patil, R. B., S. S. Mokle and S. S. Wadje. 2010. Effect of potassium humate on seed germination, seedling growth and vegetative characters of *Triticum aestivum*. Int. J. Pharma. Bio. Sci., 1(1): 21-26.

Pushpa, R. C. N. Deepalakshmi, P. S. Kumar and J.Ganesan. 2002. Studies on effect of humic acid on the seed germination in greengram. In: National Seminar on Recent trends on the use of humic substances for sustainable agriculture. Annamalai University, Tamil Nadu, India.

Quaggiotti, S., B. Ruperti, D. Pizzeeghello, O. Francisco, V. Tugnoliand N.Serenella. 2004. Effect of lowmolecular size humic substances on nitrate uptakeand expression of genes involved in nitrate transportin maize (*Zea mays*). J. Exp. Bot., 55(398): 803–813.

Revel, J. C., P. Morard, J. R. Bailly, H. Labbe, C. Berthout and M. Kaemmerer. 1999. Utilization byplants of leachate derived from municipal solid waste. J. of Envir. Qual., 28:1083–1089.

Russo, R. O., and G. P. Berlyn. 1990. The use of organic biostimulants to help low input sustainable agriculture. J. Sust. Agric., 2:19–42.

Sarvanan, K. P., P. Reddy, K. Dhanasekaran and R. Govindasamy. 2002. Effect of seed soaking in lignite humic acid on the germination and seedling growth of cotton. In:National seminor on research trends on the use of 'Humic substance for sustainable agriculture' Annamalai University, Tamil Nadu, India.

Sera, B. and F. Novak. 2011. The effect of humic substances on germination and early growth of Lamb's Quaters (*Chenopodium album*). Biologia 66(3): 470-476

Serenella, N., D. Pizzeghelloa, A. Muscolob and A. Vianello, 2002. Physiological effects of humic substances on higher plants. Soil Bio. Biochem., 34:1527–1536.

Tan, K. H. and D. Tantiwiramanond. 1983. Effect of humic acids an nodulation and drymatter production of soybean, peanut and clover. Soil Sci. Soc. Am. J., 47: 1121-1124.

Tan, K. H. and V. Nopamornbodi. 1979. Effectof different levels of humic acids on nutrients content and growth of corn (*Zea mays*). Plant Soil,51(2): 283-287.

Tejada, M. and J. L. Gonzalez. 2006. Crushed cotton gin compost effects on soil biological properties, nutrient leaching losses and maize yield. Agron. J., 98: 749-759.

Turkmen, O., A. Dursun, M. Turan and C. Erdinc. 2004. Calcium and humic acid affect seed germination growth and nutrient content of tomato. (*Lycopersicum esculentum*) seedlings under saline soil conditions. Soil Plant Sci., 54: 168-174.

Widawsky, D. A., and J. C. O. Toole. 1996. Prioritizing the rice research agenda for eastern India. In: R. E. Evension, R. W. Herdt, and M. Hossain (eds.), Rice Research in Asia, Progress and Priorities. CAB Int. Wallingford, Oxon, UK. pp. 109-130.

Yildirim, E. 2007. Foliar and soil fertilization of humic acid affect productivity and quality of tomato. Soil& Plant Sci., 57: 182–186.

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