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Effact of naphthalene acetic acid in agriculture and the role of increase yield

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ABSTRACT: Plant growth regulators are one of the most important factors for increasing higher yield in leafy vegetables. Application of growth regulators has good management effect on growth and yield of field crops. Hormones regulate physiological process and synthetic growth regulators may enhance growth and development of field crops thereby increased total dry mass of a field crop. Naphthalene Acetic Acid have been used for the enhancement of growth and yield of cereals. Naphthalene Acitic Acid, a wide broad, somatotrophin-like growth regulator in plants. It produces significant effects in promoting development of pointed ends for the root system, resulting in more, straighter and thicker roots. NAA can increase fruit setting ratio, prevent fruit dropping, promote flower sex ratio.
Key words*:* NAA, growth, yield

INTRODUCTION

Plant growth regulators are synthesized indigenously by plants, however, several studies demonstrated that plants can respond to exogenous application of these chemicals. An exogenous application of plant growth regulators affects the endogenous hormonal pattern of the plant, either by supplementation of sub-optimal levels or by interaction with their synthesis, translocation or inactivation of existing hormone levels (Arshad and Frankenberger, 1993). Plant growth regulators are one of the most important factors for increasing higher yield in leafy vegetables. Application of growth regulators has good management effect on growth and yield of field crops. Hormones regulate physiological process and synthetic growth regulators may enhance growth and development of field crops thereby increased total dry mass of a field crop (Das and Das, 1996; Abd-el-Fattah, 1997; Chibu et al., 2000; Dakua, 2002; Rahman, 2004; Islam, 2007; Cho et al., 2008). Some investigations indicated that naphthalene acetic acid (NAA) is a potential antifungal agent (Nakamura et al., 1978; Tomita 2et al., 1984; Michniewicz and Rozej, 1988).Auxin strongly inhibited myceliar growth, sporulation, and spore germination of Fusarium culmorum in vitro (Michniewicz and Rozej, 1987). The use of plant growth regulators in the field of agriculture has become commercialized in some advanced counties like Europe, USA and Japan. The current uses for plant growth regulators are not only in a high value horticultural crops but it also increase field crop yield directly either by increasing total biological yield or the harvest index. Growth substances can be divided into five classes as Auxin, Gibberellins, Cytokinins, Abcisic acid, and Ethylene. Naphthalene Acetic Acid (NAA) belongs to synthetic forms of Auxins. Auxins play key role in cell elongation, cell division, vascular tissue, differentiation, root initiation, apical dominance, leaf senescence, leaf and fruit abscission, fruit setting and flowering (Davies, 1987). Growth and yield parameters of rice are significantly promoted in response to various Auxin levels (Zahir, et al. 1998). Planofix (Naphthalene Acetic Acid) had a significant effect on plant height, number of fruiting branches, volume of boll and yield in cotton (Abro, et al. 2004). Naphthalene Acetic Acid 20ppm showed better performance in enhancing the straw and grain yields of wheat cultivars (Alam, et al. 2002). Naphthalene Acetic Acid have been used for the enhancement of growth and yield of cereals (Lilani, et al. 1991). PGRs also increase the root growth and also help promoting new roots. Rice spraying with 10 and 100 ppm NAA at tillering stage significantly increased root dry weight (Wang and Deng, 1992). Naphthalene Acitic Acid, a widebroad, somatotrophin-like growth regulator in plants. It produces significant effects in promoting development of pointed ends for the root system, resulting in more, straighter and thicker roots. NAA can increase fruit setting ratio, prevent fruit dropping, promote flower sex ratio. Hao and Ichii (1999) isolated a dominant auxinresistant mutant in rice (Oryza sativa L. ssp.japonica cv. Oochikara) in a screen for 2, 4-dichlorophenoxyacetic acid (2, 4-D) resistance and named it Lrt1 (lateral rootless). Lrt1 also exhibited resistance to synthetic auxin 1-naphthaleneacetic acid (NAA) and natural auxins indole-3-acetic

acid (IAA) and indole-3-butyric acid (IBA) (Chhun et al., 2003). Foliar application of growth regulator such as, Indole Acetic Acid (IAA), Naphthalene Acetic Acid (NAA), Ethrel, 2,4-D, Gibberellic Acid (GA3) and Malic Hydrazide (MH) produce more fertile grain/hill. Foliar application of NAA has also found to increase plant height, number of leaves per plant, fruit size with consequent enhancement in seed yield in different crops (Lee, 1990). Favourable influence of auxins such as NAA has been reported on invertase content of sugarcane (Sacher and Glasziou, 1962; Sacher et al, 1963). The use of growth regulators is considered as one of the way of increasing yield. NAA, a synthetic growth regulator has proved its potentiality that in appropriate concentration NAA affects the growth and yield of a number of plants viz. tomato (Chhonker and Singh 1959), bitter gourd (Jahan and Fattah 1991) and cowpea (Ullah et al. 2007). Reports regarding the growth and yield aspect with NAA on cereal plants including rice are available in other countries (Misra and Sahu 1957, Chaudhuri et al.1980, Singh and Gill 1985, Grewal and Gill 1986, Muthukumar et al. 2005). Solutions of NAA in concentration as high as 200 µg/ml decreased micelial growth rate of three isolates of Sclerotinia sclerotiorum (Lib.) de Bary in vitro, and the same concentration of NAA caused reduced development of S. sclerotiorum lesion on cucumber (Cucumis sativus L.) detached leaves (Al-Masri et al., 2002). Similarly, Govindan et al., (2000) indicated that soybean plants sprayed with NAA at 40 ppm after 35 days of sowing had significant increases in growth characters, yield and its attributes including number of pods and seeds, plant, seeds/pod and 100 seed weight. Senthil et al., (2003) investigated the effects of NAA at 40 ppm and IAA at 100 ppm supplied as foliar spray at 35 and 60 days after sowing on some biochemical and physiological aspects including total chlorophyll and soluble protein of soybean plant. They reported that all treatments increased the biochemical parameters of soybean and IAA treat-ment had the highest effects on the plant. Auxins such as NAA have been used since long time to improve fruit quantity and quality in many deciduous fruit tree. Antonio and Bettio (2003) showed that treating peaches cv. Diamante by the application of (NAA) at the rate of (30mg.L^{-1}) led to increase fruit size and to delay the harvesting period of peaches. Ruth et al. (2006) studied the effect of synthetic auxins on fruit size of five cultivars of Japanese plum (Kesselmen'; 'Songold'; 'Black Diamond'; 'Royal Diamond' and 'Royal Zee' by (30 mg.L NAA) at the beginning of pit-hardening, caused an appreciable and significant increase in fruit size. An increase in number of pods and grains pod-1 in gram was observed with 25 ppm NAA (Bangal et al.1982), seed and pod weight was increased with foliar application of 25-50 ppm NAA to chickpea thrice at 5-days interval, beginning at flowering stage (Bangal et al.1983). Planofix (NAA) increased number of pods plant-1, dry pod yield and 100 seed weight in groundnut (40 and 50 days after sowing) (Singh and Sharma, 1982). Suty (1984) reported that Rhodofix (NAA) at 3.4 g ha-1 increased the number of pods per plant, seeds per pod, 100 seed weight and yield in faba bean. Bai et al. (1987) applied eight foliar sprays of 25 mg L-1 NAA at 7 days intervals to Vigna rediata and reported a significant increase in seed yield and yield components. The number of pods per plant was increased by spraying 40 mg L-1 NAA on groundnut once at either 45 days after sowing (DAS) and twice at 45 and 55 DAS (Devasenapathy et al.1987). Merlo et at. (1987) also reported that NAA application on soybean at flowering increased number of branches per plant and average pod weight but latter application increased plant dry matter. 100 seeds weight was increased with the foliar application of 20 mg L-1 NAA (Ravikumar and Kulkarni, 1988). Upadhyay et al. (1993) sprayed 0, 10, 20, or 30 ppm NAA at bud initiation and pod formation stages of chickpea (Cicer arietinum L.). The highest seed yield of 2.35 t ha-1 resulted from treatment with 20 ppm NAA. Application of NAA at 50 % flowering increased plant height and dry weight that reduced the flower drop percentage and led to increase seed yield. Shukla et al. (1997) concluded that a double spray of growth regulators enhanced the number of pods per plant, pod weight per plant and gave a 17.7% higher seed yield over the control. Deotale et al. (1998) studied the effect of GA and NAA on growth parameter of soybean and obtained highest values for plant height, number of leaves per plant, number of branches per plant, leaf area, dry matter, days to maturity and seed yield with 100 mg L-1 NAA. Maximum number of seeds per pod and grain yield was obtained when NAA was applied 15 days after emergence stage (Khanzada et al. 2002).

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