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EFFECT OF DIFFERENT APPLICATION TIME OF ETHREL ON OFF-SEASON PINEAPPLE PRODUCTION AT SRIMONGAL, SYLHET

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ABSTRACT

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Experiments were carried out at Muchaibari, Srimongal under Moulvibazar Multilocation Testing Site, OFRD, Sylhet during two consecutive years of 2005 - 2006 and 2006- 2007 to find out the response of pineapple plants (cv. Giant Kew) to ethrel in early, uniform flowering and off-season production of fruits. Ethrel had significant effect on flower induction and fruit development in pineapple. Ethrel applied in September on 300 days old plants induced flowering 146 days earlier in off-season than those in the control. Hormone (ethrel) treated plot in September showed maximum flowering (84%) followed by ethrel applied in November on 360 days old plants. September treated plants took minimum duration (520 days) while control plots took maximum crop duration (613 days) for ripening. Size of fruit was increased with increasing age of plants at forcing. The highest fruit yield (31275 kg ha^{-1}) was produced by control plots and the lowest from September forcing. Maximum gross margin and benefit-cost ratio were also recorded from September forcing. The result revealed that use of ethrel as growth regulator on 300 day old plants in September could be the effective and profitable for off-season fruiting of pineapple.

Key words: Ethrel, off-season, pineapple, growth regulator, hormone

INTRODUCTION

Pineapple (*Ananas comusus* L.) is one of the major fruits of Bangladesh. It constitutes about 10% of the total fruit production of the country (Anon, 1994). However, pineapple production in Bangladesh is very low compared to that of other pineapple producing countries of the world. It also covered a very few area of land under pineapple cultivation. There is much scope of increasing its production in the country by both increasing area as well as yield. But delayed and irregular flowering and short harvesting season are the problem of pineapple production and its year round availability in Bangladesh. From different research findings it was found that, use of growth regulator in pineapple induced early flowering and helped to harvest fruits out of the season (Uddin *et al*., 1998).

Sen (1990) reported that more than 90% plants flowered 50 days after application of ethrel or ethephon at a concentration of 25 ppm in combination with urea (2%) and CaCO3 (0.04%). Wee and Ng (1971) also reported that 100ppm ethephon were the most effective in inducing flower in Malaysia. Effect of growth regulators in inducing flower varied according to environmental condition (Lecock, 1939). Early, uniform and year round production of pineapple was possible by the application of growth regulators especially ethephon (Ethrel) and calcicon carbide (Bose *et al*., 1983). In earlier 250 ppm ethephon (ethrel) was found suitable for induction of flowering in pineapple under Bangladesh condition. Literature reports indicate that the efficacy of ethephon at lower concentration increases if urea and alkali like calcium carbonate and sodium carbonate are added to it (Dass *et al*., 1975; Dass *et al*., 1976). A vast area of Srimongal is under commercial pineapple production. To stagger the harvesting period of pineapple an On-Farm trial was conducted at Srimongal, under MLT site Moulvibazar to predict the appropriate time of hormone/regulator (ethrel) application to make availability of pineapple in the market during off-season and to evaluate the economic performance of off-season pineapple and effectiveness of ethrel to induce flowering. The experiment was conducted to find out the response of pineapple plants (cv. Giant Kew) to ethrel in early, uniform flowering and off-season production of fruits.

MATERIALS AND METHODS

The experiment was carried out for two consecutive years of 2005 - 2006 and 2006- 2007 at Muchaibari, Srimongal under Moulvibazar Multilocation Testing Site, On-Farm research division, Bangladesh Agricultural Research Institute, Sylhet with six dispersed replications. Four treatments were as September forcing (5th September), October forcing (5th October), November forcing (5th November) with a control plot on 300, 330 and 360 days after planting of pineapple plants, respectively for each of the year. Plantation was made almost one year before the treatment application according to plant age for each year. Number of treated plants was 100 and control was also 100 for each time of application. The area of each plot was 20 m^2. Pineapple plants were grown in line and spacing was 40 cm x 50 cm. Plot to plot distance was 80 cm and paired row system was followed. Variety was Giant kew and slip sucker

was used. The spray volume was made with Active ingredients of ethrel were 39%. Soil sample of the experimental plots were collected before setting up the trial at 0 - 20 cm depth and analyzed in the laboratory of SRDI, Sylhet. The analytical results of the collected soil are presented in Table 1.

Table 1. Initial soil test values of the experimental plots

Parameters	P^H	OM (%)	Total N (%)	P (µg /g)	K (meq/100g)	S (µg g)	Zn (µg /g)	B (µg /g)
Value	4.7 (acidic)	1.04 (low)	0.12 (low)	78.43 (very high)	0.29 (medium)	39 (high)	1.39 (optimum)	0.05 (very low)

From the above soil analytical results it was found that initial soil status was not so good. Although the phosphorus status was very high but due to high acidity it was fixed and could not be available for plants. This is why phosphorus application was ensured for the cultivation of pineapple. Fertilizer was applied two times at mid-June and 1st week of October as a farmer's dose @ 55 kg (total) at 1:1:1 N, P, K/1000 plants. Ethrel was applied at 5th September, 5th October and 5th November, 2005 with a control plot per application for the year 2005-2006. Similar application date was maintained for the year 2006-2007. The experiment was carried out followed by randomized complete block design (RCBD). Weeding and other intercultural operations were done uniformly for all the plots at 120 DAT and just before the top dress of urea and TSP in the crop management for better crop growth during the study. Furthermore, weeding was done as and when necessary. Fifty millimeters of the ethrel (39% a.i.) solution was applied /poured at the heart of each plant in the morning at 7.00 to 9.00. Date of flowering, earliness and duration, flowering percentage, fruit yield and fruit related characters were recorded from all plants under the treatments. The data collected were analyzed statistically using computer package MSTATC followed by Gomez and Gomez (1983). Percent data were transformed as necessary for statistical analysis. The mean differences were separated by DMRT for interpretation at 5% level of significance.

RESULTS AND DISCUSSIONS

Effect on flowering

Application of ethrel had a marked influence on inflorescence characters (Table 2). Ethrel applied on different dates induced earlier flowering over control. Inflorescence appeared 40 days earlier in ethrel treated plots in 5th September on 300 days old plants than those in the control, which was significantly different from other treatments. It took 14 days from the 1st appearance of inflorescence to full appearance while control plots took 18 days. The early flowering in September on 300 days old plants can be related with favorable temperature and also the influence of ethrel. Duration of flowering (1st to last) followed a pattern similar to that obtained for first and full appearance of inflorescence. Duration of flowering was minimum in November forcing and the highest in control. The results agreed well with that of Sarker *et al*., (2001). Flowering percentage was minimum in treated plants compared to that in control plants. The difference between control and treated plants ranged from 45 to 84%. However, plants in September forcing flowered 109 days earlier than November, 27 days from October forcing and 144 days earlier than control. The earliness got a high market price and could be meet up the off-season demand of pineapple. This treatment also administered significant influence on ripening days. Ethrel applied on 300 days old plants in September and 330-day-old plants in October took minimum days (520 and 585 days). Control plants (without hormone) took the maximum ripening days (613 days).

Table 2. Effect of growth regulator (ethrel) on off-season flowering of pineapple (pooled data of the year 2005-06 and 2006-07)

Treatment	Plant age (days)	Appearance of 1st inflorescence (days)	Full appearance of inflorescence (days)	1st flowering (days)	Last flowering (days)	Flowering (%)	Ripening (days)
September forcing	300	340 d (40)	354 d (14)	346 d	362 d	45 c	520 c
October forcing	330	372 c (42)	387 c (15)	379 c	393 c	58 bc	585 bc
November forcing	360	455 b (95)	431 b (16)	465 b	473 b	78 ab	592 b
Without hormone	300	486 a (186)	504 a (18)	495 a	514 a	84 a	613a
LSD (0.01)		1.53	3.90	3.05	4.75	22.66	9.44
CV %		0.21	0.52	0.42	0.62	19.65	0.94

Effect on fruit characters and yield

Fruit length, fruit diameter, number of fruits/ha and fruit yield/ha were significantly influenced by different treatments. No significant differences were observed in case of fruit weight with crown, crown weight and number of leaves/plant (Table 3). Length of fruits increased by ethrel compared to control. However, the longest fruit (12.37 cm) was obtained from September forcing with ethrel and the shortest (11.58 cm) from control plot, which was statistically similar to October and November forcing with ethrel. This result is supported by the findings of Sarker *et al*. (2001). Fruit diameter also induced by the application of ethrel. The highest fruit diameter (6.25 cm) was obtained from September forcing which was statistically identical with October forcing and the lowest (5.79 cm) was found from control plot (without hormone). Total number of fruit/ha was significantly influenced by the treatments (Table 3). The highest number of fruits/ha was recorded from control plot, which was late flowering/fruiting, and the value was statistically identical with November forcing. Application of ethrel on 300 days old plants in September had the lowest number of fruits/ha but earliness as off-season fruiting and it was not significantly different from October forcing. Fruit yield/ha also differed significantly among the treatments. Yield difference between control and treated plants ranged from 19615 to 31275 kg/ha. The highest fruit yield/ha was obtained from control plot (without hormone) followed by November forcing. Though the control plot gave the highest fruit yield, it was late in fruiting. Therefore, application of ethrel is more effective in inducing off-season flowering as well as fruiting in September forcing than the others, which could be helpful to make availability of pineapple in the market as an off-season fruit.

Table 3. Effect of growth regulator (ethrel) on yield and yield related characters of off-season flowering of pineapple (pooled data of the year 2005-06 and 2006-07)

Treatment	Fruit length (cm)	Fruit diameter (cm)	Fruit weight with crown (kg)	Crown weight (kg)	Number of leaves /plant	Number of fruits/ha	Fruit yield (kg/ha)
September forcing	12.37 a	6.25 a	1.63	0.26	41	14312 c	19615 c
October forcing	11.80 b	5.97 ab	1.51	0.28	38	16473 bc	20585 bc
November forcing	11.85 ab	5.89 b	1.62	0.27	37	20219 a	27891 a
Without hormone	11.58 b	5.79 b	1.53	0.26	39	24350 a	31275 a
LSD (0.01)	0.52	0.31	-	-	-	4802	7664
CV %	3.57	3.03	6.88 ns	12.37 ns	8.49 ns	14.98	18.14

Economic Evaluation

Benefit-cost analysis revealed that the maximum gross margin (Tk. 227141/ha) as well as price/fruit (TK.18.33) were achieved from September forcing and minimum from control (Table 4). The highest BCR (7.45) and MBCR (17.46) were achieved from September forcing. The higher BCR (5.22) was found from control plot, but it was only for seasonal supply of pineapple and could not be able to meet up off-season demand of pineapple.

Although the yield and number of fruits were lower than the control plot, but use of ethrel as growth regulator in pineapple is an effective measure to induce flowering for off-season fruiting. The results revealed that September forcing would be the most effective in terms of off-season fruit yield and economics at Srimongal area under AEZ 29.

Table 4. Effect of growth regulator (ethrel) on the economic performance of off-season pineapple production (pooled data of the year 2005-06 and 2006-07)

Treatment	Number of fruits/ha	Price/fruit (Tk.)	Gross return (Tk/ha)	Total variable cost (Tk/ha)	Gross margin (Tk/ha)	Benefit cost ratio	Marginal benefit cost ratio
September forcing	14312	18.33	262339	35198	227141	7.45	17.46
October forcing	16473	9.33	153301	35198	118103	4.36	0.48
November forcing	20219	6.75	136478	35198	101280	3.88	-2.14
Without hormone	24350	6.17	150240	28776	121464	5.22	-

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