Physiological studies n tuberose plant(polianthes tuberosa l.)

Atef Sayed Ismail Tawilla

The experimental study was carried out at the Experimental Farm, of the Faculty of Agriculture at Moshtohor Zagazig University, duringtwo successive seasons (1998-1999) and (1999-2000).The aim of the study was how to prolong the period of flowering ofPolianthes tuberosa L. first by spraying growth regulators (100 p.p.m.GA3 and 50 p.p.m. PP333).Another part included the effect of planting dates (April, June andAugust) after storing the bulbs for a period 1 week, 60 days and 120 days. The storing temperatures were 7°C±1 or 26°C±2, and the plants were intercropped with or without Tagetes erecta.The most important results are as following:I. Effect of growth regulators on the growth andflowering: -GA3 at 100 p.p.m. significantly increased the plant height overcontrol and over PP333.GA3 at 100 p.p.m. and paclobutrazol at 50 p.p.m. treatmentssignificantly increased the number of leaves on the stalk.Both growth regulators GA3 at 100 p.p.m. and PP333 at 50 p.p.m. increased the fresh weight of the vegetative growth of the aerial parts ofthe plant over control. Those weights exceeded the control by 100% inthe 1st season and by 78% in the 2nd season.The highest values of the dry leaves / stalk resulted from spraying the plants twice with GA3 at 100 p.p.m. in both seasons whish gave thebest results and increased the fresh and dry weights of leaves.PP333 at 50 p.p.m. decreased the length of stalk, while spraying the GA3 increased it. The tallest stalk in both seasons was obtained from GA3at 100 p.p.m. sprayed for three times.GA3 with more number of sprays produced the heaviest weight ofstalk.The stalk thickness increased in both seasons with PP333 sprayings3 times. Both growth regulators resulted significant increase in the floretnumber and fresh weight over control.PP333 treatments reduced the length the of flowering portion.II.Effect of growth regulators on the bulb yield: -Spraying PP333 3 times gave the heaviest fresh and dry weight ofroot stock.GA3 showed retardation effect on the fresh and dry weight of rootstock.Spraying PP333 two times increased the bulb yield by 10.40 and35.81% over control plants in the first and second season respectively. The 3 applications of PP333 resulted in 61.54 and 83.60% freshweight of bulbs over control.PP333 treatments promoted the growth of bulbs compared with GA3and control treatments.III.Effect of growth regulators on the chemical composition: -GA3 increased N% in plant flower, in bulbs, while decreased it inleaves.The three sprays of PP333 increased the N% in the flower and thebulb, wile decreased it in the plant leaves.A high P% in the leaves and flowers was noticed with treatment ofGA3 as 3 sprays. The high P% in bulbs was noticed with GA3 of 2 sprays.132SummaryPP333 increased the P% in the different plant parts compared withcontrol plants.K% was only increased in the bulbs due to the 3 sprays of GA3 or PP333, whereas PP333 increased the K% in the leaves.GA3 and PP333 application at different rates increased total carbohydrates percentage in different plant parts except for 2 sprays of GA3 which decreased the K% in the flower tissue compared with control.The highest percentages of total carbohydrates in plant leaves were observed with 2 sprays of PP333 and 3 sprays for the flowers and bulbs.The second part: -I. Effect of planting date on the growth flowering: -April planting date gave tallest plants of Polianthes tuberosa. The atmospheric temperature is more suitable during the growth period of April as compared to June and AugustThere was a decrease in the number of leaves / stalk with August planting date in the l st season, and June and August in the secondseason.The fresh weight of the plant and leaves / stalk significantly decreased with the August planting date.The tallest stalk and the heaviest weight of stalk resulted from tuberose bulbs planted in April, while

August planting resulted in the least thickness the stalk in both seasons.The planting date had promising effects on the flower quality and the best treatment was the April planting date, which significantly increased the length of the flowering portion over June and August, this valued 54% over August planting date in the 1' season and 33% in the second season.April planting date produced significantly the heaviest fresh weight of flowers / stalk in both seasons.H. Effect of planting date on the bulb yield: --April planting date gave 75% increase in the fresh weight of root stock / plant over June and 721% over August planting date in the season, and surpassed the fresh weight of root stock of June by 67% and over August planting date by 676% in the second season.-April planting date significantly increased the number, the fresh and dry weights of bulbs / plant as compared to June and August planting dates. The least number of bulbs and weight of bulbs were produced from the August planting date in both seasons. The April planting date was very promising for increasing the dry weight of the rootstock/plant.III.Effect of intercropping on the growth and flowering: -The intercropping with Tagetes erecta had no effect on the plant height, number of leaves / stalk or; leaf length but the fresh weight of theplant increased by intercropping.Intercropping did not influence length, number of florets / stalk,fresh weight of florets / stalk or the length of flowering portion, but increased the fresh weight of the stalk.IV.Effect of the clump storage on the growth and flowering: -The storage of Polianthes tuberosa clump under low or high temperatures after planting the bulbs had no effect on the plant height, the number of leaves / stalk and the fresh and the dry weight of leaves in thetwo seasons.The storage at the high temperature (26°C+2) gave significantly heavier fresh weight than storing the bulbs at low temperature (7°C±1). In the second season, the plants grown from bulbs stored at high temperature as 26°C±2 produced significantly more flowers / stalk when compared with the storing under low temperature.V. Effect of month x storage on the growth and flowering: -Storing the bulbs of Polianthes tuberosa for one week under 7°C± I x April significantly increased the plant height over June x 7°C+1 and June x 26°C+2.Storing the bulbs for long period as August x 7°C±1 had decreasing effects on the number of leaves / stalk.April x 7°C±1 was the best treatment which increased the fresh weight of the plant over any other treatment in the two seasons. The least fresh weight of the plant and leaves / stalk due to the interaction was with August x 7°C+1 in both seasons.The length of the stalk / plant significantly increased due to April planting date whatever the temperature of storing was.August x storage temperature, on the other side, produced the shortest stalk length.The fresh weight of the stalk decreased due to the longer period of storage under the low or high temperature.The number of florets / stalk increased due to storing in April x 7°C±1, it seemed to be the best treatment. The latest planting date (August) had some deteriorating effect on the flowering of Polianthes tuberosa.The interaction April x 7°C±1 or April x 26°C±2 gave the tallest length of flowering portion in both seasons.VI. Effect of storage x intercropping on the growth and flowering:-Intercropping may be useful to increase the income also the storage at room temperature is also valuable and will save the costs of cold storing of Polianthes tuberosa L.The number of leaves / stalk was nearly the same in both seasons due to the storage temperature x intercropping. However storage at 26°C±2 x intercropping with Tagetes erecta showed insignificant increase in this respect.The heaviest fresh and dry weights of the plants was noticed with the storage treatment at 26°C±2 x intercropping with Tagetes erectaThe tallest stalk / plant and fresh weight of the stalk were with storage of bulbs at 26°C+2 x intercropping with Tagetes erectaThe number of florets / stalk in both seasons slightly differed due to the interaction (storage temperature x intercropping). Storage at 26°C+2 x intercropping with Tagetes erecta had the most promising effect on the fresh weight of florets / stalk.The length of the flowering portion / stalk was positively increaser(with the interaction storage temperature 26°C±2 x intercropping with Tagetes erecta which gave the tallest portion.VII.Effect of month x storage temperature x intercropping on the growth and flowering.The interaction April planting date x storage at 7°C+1 x intercropping with Tagetes erecta gave the tallest plants in both seasons. The least number of leaves / stalk was found with the treatment August planting date x storage at 7°C±1 x intercropping with Tagetes erecta in both seasons.April x storage at 26°C±2 x intercropping with T. e. gave about 25% increment in the fresh weight of plant in gms over the August xstorage at 7°C+ I x without intercropping.The length of the flowering stalk / plant positively influenced in both seasons due to the interaction of April planting date x bulb storage at

7°C±l x with and without intercropping with Tagetes erectaThe shortest stalk resulted in both seasons with the interaction August x 7°C±l x plants without intercropping. There is no need for coolstorage with April planting date.There were always increases in the fresh weights of the stalks of Polianthes tuberosa when Tagetes erecta was intercropped despite of storage temperature or planting date. Intercropping may be positive factorfor better quality of flowers.The interactions of August planting date x storage of bulbs at 7°C±I x without intercropping seriously decreased the number of florets / stalk in both seasons, the long period of storing the bulbs at 7°C+I had the uperhand on deteriorating the flower quality by decreasing thenumber of florets / stalk.Early planting date is very essential for improving the flowerquality during the summer flush.The intercropping had promising effect on improving the quality when planting of Tagetes erecta was early in April. The calculated increase for April x storage at 7°C±I x intercropping valued 54% in the Is' season over the August x storage at 7°C±1 x without intercropping.The longest flowering portion resulted from the interaction April x storage at 7°C±I x intercropping with Tagetes erectaIIX. Effect of duration on the chemical composition: -The data clarified that the highest percentages of N were found within the plant organs (leaves, flower and bulbs) when the clumps werestored 60 days then planting was in June, after storing under 26°C+2. However, the highest N% in the plant organs was not a mirror for the best growth.The least percentages of phosphorus were found in plant organs with the treatment which gave the best growth when the bulbs were stored for one week at 26°C±2 then planted in April.K% determination could be a sign for the requirements of the plant to give better growth with Polianthes tuberosa, the proper K% in the leaves ranges between 2.14% - 2.80% which realizes the best growth.The highest K% as 1.99 in bulbs was once coincided with 60 days storing at 26°C+2 and with 120 days storing at 7°C±1. Both treatments were not the best for the vegetative, flowering or bulb growth.The highest total carbohydrates content was with week storage duration with the 7°C±1 temperature. This was followed by the week storage duration at 26°C+2, the percentages valued 17.75 and 17.46% respectively in the leaves. The two treatments were the superior for better vegetative and flowering growth. whereas, the least carbohydrate percentage in the leaves as 15.63 of P. tuberosa, was with the 120 days bulb storing duration at 7°C±1. This treatment was not good in the vegetative and flowering growth. It means that the best growth was coincided with the high percentage of carbohydrates in leaves and flowers.The cold storage in most cases with the bulbs increased the carbohydrates content as compared with the high temperature. The highest carbohydrates were found with the bulbs, the flower followed by leaves. The chemical analysis was a good detector for the growth.The chemical analysis showed that the different parts of the plant varied in the percentage of N, P, K and carbohydrates. As for the content of auxins, phenols and reducing sugars they were highest in content asinfluenced by the growth factor. The auxins gave the highest content as 0.6044 fiber and fleshy roots of the 60 days storage and the lowest content was with the bulbs when stored 120 days.The reducing sugars raised with increasing of the storage period to reach its highest value with June x 26°C± 2 as 0.2400 (mg / gm d. w.) compared to the minimum as 0.1625 for April planting date.The auxins content as (mg / gm d.w.) was 0.0861 in the fiber and fleshy roots. The content during the flowering stage declined to 0.0664.The phenols content decreased from 0.1273 with the before flowering to 0.1129 (mg/g d.w.) during the flowering stage. The ratio of phenols to auxins was 148: 100 (before flowering) and 170: 100 during flowering.The data indicated that the auxins content was lower in the vegetative growth before flowering as compared to content during flowering, as the values were 0.0905: and 0.1576, respectively.The reducing sugars also showed increasing content in the flowering stage as compared to the vegetative growth.As for the phenol the medium size bulbs had the highest content as 0.1535 (mg/g d.w.) which gave the minimum ratio accompanied with better growth.The ratios of phenols: auxins were 158: 100, 55: 100 and 108: 100, such relation indicated that when the phenols depleted the growth was better.ReferencesLiterature cited-Abaas, M. M. (1994):Effect of some growth retardants on Celosia argenta and Zinnia elegans plants. M. Sc. Thesis., Fac. Agric., Cairo Univ.-Abo-El-Ghait, E. M. and Wahba, H. E. (1994):Studies on Viola odorata L. 2-Response of Viola odorata. L. to some growth regulators. Annals of Agric. Sci. Moshtohor, 32 (1) : 433-445.-Aiyer, Yegne Narayan, A. r. (1949):Mixed cropping in India. India J. Agric. Sci. 19 : 439 — 543. (c. f. Christidis and Harrison 1955, Cotton growing problems, Nc Grow-Hill Book Co., Inc., New York,

Toronto —London, pp-Andrews, D. J. and Kassam, A. H. (1976):The importance of multiple cropping in increasing world food supplies. Multiple Cropping, A. S. A. Special Publication No. 27 : 1-10.-Annis, D. C. and Starman, T. W. (1990) :Influence of photoperiod and gibberellic acid on growth and flowering of Craspedia uniflora. Proc. 87th Ann. Meet. Amer.Soc. Hort. Sci., 25 (9) : 1092.140References-A. 0. A. C (1980):Official Method of Analysis 12th Ed. Association of Official Analysis chemists: Washington. D. C. U. S. A.-Aoba, T. (1974):The effect of temperature on bulb and tuber formation in bulbous and tuberous crops VI. Bulb formation in bulbous Irises. Journal of the Japanese Society for Horticultural Science 43 (3) 273 — 280 Yamagato University. Tauruoka, Yamaga, Japan (Hort. Abst. 46: 5962).-Armitage-A. M and Laushman —JM. (1990 a) :Planting date, in — ground time affect cut flowers of Acidanthera, Anemone, Allium, Brodiaea, and Crocosmia. Hort Science, 25: 10 , 1236 — 1238.-Armitage-AM; Laushman-JM. (1990 b):Planting date and in-ground time affect cut flowers of Liatris, Polianthes tuberosa, and Iris. Hort Science, 25: 10, 1239-1241.-Ashoub, A. H. (1978):Inter and intra specific competition among onion and cotton plants. M. Sc. Thesis, Fac. Agric., Ain —Shams, Univ. Egypt.-Badawi, 0. E. F. (1998) :Physiological and anatomical studies on tuberose bulbs (Polianthes tuberosa L.). Ph. D. thesis Fac. Agric. Cairo Univ.References- Bakker, J. and W. Helle. (1958):Lelie (Lelies) Jversl. Proefst. Bloem. Aalsmeer, pp. 86 —101 (Hort. Abst, 34: 1047).- Barzilay — A; Ben-Jaacov-J; Chen-A; Ion — A; and Halevy-AH. (1992):Minigladiolus as a flowering pot plant. Scientia-Horticulturae, 49 : 1-2, 117-124; 3p1.Batugal, P. A.; Cruz, A. Dela; Libunao, W. H.; Khwaja, A. M. and De La Cruz, A. (1990) :Intercropping potato with maize in lowland Philippines. Southeast Asian Program for Potato Research and Development, Manila, Philippines, Field Crop Res., 25 (1,2):83 — 97.- Belorkar- PV; Patil- BN; Dhumal — BS; Golliwar-VJ; and Dalal — SD. (1993) :Effect of nitrogen levels and gibberellic acid on growth, flowering and yield of tuberose (Polianthes tuberosa L.). J. — of — Soils — and — Crops, 3(2): 106 — 108.- Bhattacharjee —SK. (1984) :The effects of growth regulating chemicals on Gladiolus. Gartenbauwissenschaft, 49 (3): 103 — 106References-Biswas-J; Bose-T. K; and Maiti-R. G. (1983):Effect of growth substances on growth and flowering of tuberose (Polianthes tuberosa L.). South — Indian- Horticulture. 31 : 2-3, 129 — 132.-Borah — SIC. (1993):Studies on intercropping tuberose with vegetables. South —Indian — Horticulture, 41 (3). 162 — 165.-Bose, T. K.; Jana, B. K.; and Mukhopadhyay, 7’. P., (1979):Effect of temperature and duration of storage of bulbs on growth and flowering in Hippeastrum. Punjab Horticulural Journal (1979) 19 (3/4) 205 — 207 En, 6 ref. (C. F. Hort. Abst, 50, 9279).-Center International de Agriculture Tropical (CIAT), (1973):Ann. Report CIAT, Palmira, Colombia. (c.a. Anderewes, D. J. and Kassam, A. A., 1976, The importance of multiple cropping, A. S. A. Special Publication N 27: 1-10).-Choudhary —ML (1987):Effect of growth regulatants on growth and flowering of tuberose (Polianthes tuberosa L.). Annals — of — Agricultural —Science — Ain — Shams — University, 32 (2): 1451 — 1457.