

早熟芽变“嘎拉”与普通“嘎拉”苹果的生物学性状比较

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摘要:以普通“嘎拉”苹果为对照,对早熟芽变“嘎拉”的生物学性状进行了研究。结果表明:早熟芽变的物候期与普通“嘎拉”基本一致,但成熟期提前 25 d 左右;芽变“嘎拉”树体变矮,分枝变多,节间长、叶宽和叶厚分别为“嘎拉”的 1.07、1.16、1.17 倍;但分枝长、叶长、叶柄长没显著变化;主干增粗速度变慢。芽变“嘎拉”的花瓣长、宽,花药纵、横径,花柄长度、粗度,花粉萌发率,花冠大小分别为“嘎拉”的 0.87、1.16、0.94、1.14、0.63、1.49、0.70、0.87 倍。早熟芽变“嘎拉”的平均单果重为 206.2 g,比对照增加了 25.3%;可溶性固形物含量为 13.87%,降低了 4%;可溶性糖含量为 5.55%,比对照降低了 9%;可溶性酸含量为 0.1%,降低了 66.6%;糖酸比为 56,提高了 267%;果面色泽为条红,着色均匀。综合各项指标认为,该早熟芽变是一个综合性状优良的变异。

关键词:“嘎拉”;苹果;芽变;早熟;生物学性状

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我国是世界上最大的苹果生产国,面积和产量均居世界首位,苹果生产在国民经济中占有重要地位^[1]。目

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前,我国苹果生产以晚熟品种为主,早中熟的品种比例偏少,结构不合理^[2]。近年来新发展的苹果园仍以晚熟品种为主,早中熟苹果品种较少^[3-5],究其原因主要是国外引进的早中熟品种口味偏酸,国内新选育的早、中熟品种也较少^[6]。过国南等^[7]报道,建国以来我国通过各种育种技术培育出苹果新品种有 200 多个,在所有培育出的品种中,早熟品种只占 16.9%。目前,我国生产上主要栽培的早、中熟品种大多是从国外引进的品种,如“藤牧一号”、“松本锦”、“信浓红”、“嘎拉”及其芽变系。

influence of different fruit part on yields and quality of kiwi fruit between terminal bud,time bud and the third bud were studied. The results showed that the fruit yield and quality between the crown,time shoots mother and three had significant differences;and there was no significant difference between sugar content,the order were,time buds>terminal bud>the third bud;after ripening order were,terminal bud>time bud>the third bud;there were significant difference between the upper mother tendril,the central mother tendril and the lower mother tendril on fruit yield and quality,and there was no significant difference between sugar content,the order were the central mother fruit>the lower mother fruit>the upper mother fruit;during after ripening was the upper mother fruit>the central mother fruit>the lower mother fruit;there were significant difference of the first,second,third quarter of fruit tendril between the fourth quarter of fruit tendril on weight,there was no significant difference between the former three treatments,and there were no significant difference between the first and second fruit tendril on fruit weight,but had significant difference between first and third,and the third and fourth quarter of fruit tendril on yields,there was no significant difference of sugar content,the order was,the third quarter of fruit tendril>fourth quarter of fruit tendril>the second quarter of fruit tendril>first quarter of fruit tendril;after ripening order was,the first quarter of fruit tendril>the second quarter of fruit tendril>the third quarter of fruit tendril>fourth quarter of fruit tendril. It was easy to know different fruit part significantly influenced single fruit weight,yield and fruit sugar,also affected the fruit weightlessness rate,shape index and after ripening time. This paper advised different fruit parts as one of the important basis for thinning flowers and fruits,and for judgment of the ripening time of kiwi fruit,to provide scientific cultivation technology and management measures on kiwi fruit.

Key words: kiwi;fruit parts;fruit;yield;quality;influence

然而这些早、中熟品种均存在不同程度的缺陷^[8]。

“嘎拉”苹果是新西兰培育的一个优良的中熟品种,果形端正,肉质致密、细脆、汁多,味甜微酸,香气浓郁,品质上乘,较耐贮藏,结果早,坐果率高,但果实较小^[9]。该试验以田间发现的大果早熟芽变“嘎拉”为试材,对其主要生物学性状进行研究,以期及早熟芽变“嘎拉”的利用提供理论依据。

1 材料与方法

1.1 试验材料

早熟芽变“嘎拉”发现于河北省顺平县西阳各庄,为“嘎拉”苹果树上采集的枝条,高接结果后发现。用于该试验花器官、果实等性状研究的为6 a生早熟芽变“嘎拉”和15 a生“嘎拉”苹果树,基砧均为八棱海棠。用于树体大小、枝条性状研究的为2 a生“嘎拉”与早熟芽变,基砧均为八棱海棠。

1.2 试验方法

1.2.1 植物学形态指标的测定方法 以2 a生早熟芽变“嘎拉”和“嘎拉”苹果树为试材,测量各单株的高度、粗度、叶片长度和宽度、叶厚、新梢长度、节间长。叶形指数用叶片长和宽的比值表示。每个品种选5株测量其高度、粗度,在每株上选5个枝条测量其新梢长度,每个枝条选3片成熟叶进行测量。主干粗度用游标卡尺在嫁接口上5 cm处测量。在结果期6 a生早熟芽变“嘎拉”和15 a生“嘎拉”树上随机选取20朵花,测量其花瓣长和宽、花柄长度和花冠大小。从早熟芽变“嘎拉”和“嘎拉”树上采集花朵,随机选取50粒花药对其纵横径进行测量。花粉萌发率测定参照屈海泳等的方法^[10]。

1.2.2 果实品质的测定方法 在果实成熟期,分别从6 a生芽变“嘎拉”和15 a生“嘎拉”树上随机采收20个果实进行品质测定。用电子天平测单果重,游标卡尺测量纵横径,阿贝折射仪测定可溶性固形物,意大利FT327果实硬度计测定果实硬度。把芽变“嘎拉”和“嘎拉”苹果果实分别分成4组,每5个果为1组,从每个果实的胴部随机选取一部分混匀用于总酸、可溶性糖的测定。总酸量用氢氧化钠标准滴定法测定^[11],可溶性糖用蒽酮比色法测定^[12]。

1.3 数据分析

以上结果均用SPSS软件处理分析。

2 结果与分析

2.1 树体大小比较

对2 a生的“嘎拉”与芽变“嘎拉”幼树进行了树体调查,由表1可知,芽变“嘎拉”树体变矮,高度为215.00 cm,“嘎拉”为252.00 cm,高度减少37.00 cm;芽变“嘎拉”主干粗度变细,主干直径为23.60 mm,“嘎拉”为28.60 mm,减小了5.00 mm;芽变“嘎拉”发枝量增多,每株平均分枝数为15.00条,“嘎拉”为6.00条,芽变“嘎拉”的发枝量是“嘎拉”的2.50倍。树体、主干粗度和分枝数之间差异显著,但二者分枝长度无明显变化。

表1 “嘎拉”与芽变“嘎拉”树体大小比较

品种	树体高度/cm	主干粗度/mm	分枝长/cm	分枝数/条
“嘎拉”	252.00a	28.60a	38.87a	6.00b
芽变“嘎拉”	215.00b	23.60b	40.79a	15.00a

注:不同小写字母表示 Duncan's 新复极差检验 5%显著水平。下同。

2.2 节间长度和叶片大小比较

对2 a生“嘎拉”与芽变“嘎拉”苹果树枝条节间长度和叶片大小进行调查,由表2可知,芽变“嘎拉”节间变长,平均长度为2.74 cm,“嘎拉”为2.56 cm,经显著性分析差异显著;芽变“嘎拉”叶片变宽变厚,芽变“嘎拉”平均叶宽4.71 cm,“嘎拉”为4.07 cm,芽变“嘎拉”是“嘎拉”的1.15倍;芽变“嘎拉”平均叶厚为0.21 mm,“嘎拉”为0.18 mm,芽变“嘎拉”是“嘎拉”的1.16倍,经显著性分析叶宽、叶厚差异显著。二者的叶长和叶柄长无显著变化。

表2 “嘎拉”与芽变“嘎拉”节间长度和叶片大小比较

品种	节间长/cm	叶长/cm	叶宽/cm	叶厚/mm	叶柄长/cm
“嘎拉”	2.56b	8.05a	4.07b	0.18b	2.75a
芽变“嘎拉”	2.74a	7.97a	4.71a	0.21a	2.79a

2.3 花器官比较

对结果期芽变“嘎拉”和“嘎拉”的花器官进行了调查,由表3可知,早熟芽变“嘎拉”花瓣变短变宽,花瓣长和宽分别为2.47和2.01 cm,而“嘎拉”花瓣长和宽分别为2.83和1.74 cm,早熟芽变“嘎拉”花瓣长宽分别是“嘎拉”的87%和116%,经显著性分析差异显著;早熟芽变“嘎拉”花药纵径变长,平均为0.065 mm,“嘎拉”为0.057 mm,经显著性分析二者差异显著,但横径没有显著变化;早熟芽变“嘎拉”花柄变短变粗,花柄长度、直径分别为1.70、1.56 mm,而“嘎拉”花柄长度、直径分别为2.70、1.05 mm,早熟芽变“嘎拉”花柄长度、直径分别是“嘎拉”的63%和149%,经显著性分析二者差异显著;早熟芽变“嘎拉”花粉萌发率降低,平均萌发率为47.00%,而“嘎拉”为67.00%,降低了30%,二者差异显著;早熟芽变“嘎拉”花冠变小,花冠直径为4.85 cm,“嘎拉”为5.56 cm,早熟芽变“嘎拉”是“嘎拉”的0.87倍,经显著性分析差异显著。

表3 “嘎拉”与芽变“嘎拉”花器官比较

品种	花瓣长/cm	花瓣宽/cm	花药横径/mm	花药纵径/mm	花柄长度/cm	花柄直径/mm	花粉萌发率/%	花冠直径/cm
“嘎拉”	2.83a	1.74b	0.090a	0.057b	2.70a	1.05b	67.00a	5.56a
芽变“嘎拉”	2.47b	2.01a	0.085a	0.065a	1.70b	1.56a	47.00b	4.85b

2.4 果实性状比较

分别采摘7月下旬早熟芽变“嘎拉”果实和8月中旬成熟“嘎拉”果实,对其大小和内在品质进行测定,由表4可知,早熟芽变“嘎拉”单果重变重,平均为206.20 g,对照

“嘎拉”为 164.60 g,增加了 41.6 g,经显著性分析差异显著;早熟芽变“嘎拉”果实变大,纵、横径分别为 66.89 和 78.49 mm,而“嘎拉”的纵、横径分别为 62.05 和 72.26 mm,早熟芽变“嘎拉”的纵横径分别为“嘎拉”的 108%和 109%,经显著性分析二者差异显著;但果形指数差异不明显;芽变“嘎拉”颜色为条红,“嘎拉”为片红。

表 4 果实性状比较

品种	单果重/g	纵径/mm	横径/mm	果形指数	成熟期	颜色
芽变“嘎拉”	206.20a	66.89a	78.49a	0.85a	7月中下旬	条红
“嘎拉”	164.60b	62.05b	72.26b	0.86a	8月中旬	片红

由表 5 可知,早熟芽变“嘎拉”果实硬度、可溶性固形物含量、可滴定酸含量都降低,分别为 11.4 kg/cm²、13.90%和 0.10%,而“嘎拉”硬度、可溶性固形物含量、可滴定酸含量分别 17.90 kg/cm²、14.50%和 0.30%,早熟芽变“嘎拉”硬度、可溶性固形物含量、可滴定酸含量与“嘎拉”相比分别降低了 36.6%、4%和 66%,经显著性分析三者差异显著;但可溶性糖含量差异不明显。但早熟芽变“嘎拉”果实口感比“嘎拉”甜,早熟芽变“嘎拉”果实的糖酸比为 56.00,“嘎拉”为 20.70,早熟“嘎拉”芽变是“嘎拉”的 2.67 倍,经显著性分析二者差异显著。

表 5 果实品质比较

品种	带皮硬度 /kg·cm ⁻²	去皮硬度 /kg·cm ⁻²	可溶性糖 /%	可滴定酸 /%	糖酸比	可溶性固形物/%
芽变“嘎拉”	11.40b	6.53b	5.60a	0.10b	56.00a	13.90b
“嘎拉”	17.90a	10.90a	6.20a	0.30a	20.70b	14.50a

3 结论

早熟芽变“嘎拉”与“嘎拉”相比叶变宽变厚,节间变

长,分枝增多,花瓣变短变宽,花药纵径变小,花柄长度减小、主干粗度减小,花粉萌发率降低,花冠变小,果实变大变重,硬度减小,可滴定酸、可溶性固形物降低,但糖酸比增加。但叶长,1 a 生枝条长度,花药横径,可溶性糖含量没有显著变化。综合各项指标认为,此早熟芽变“嘎拉”是一个优良的变异。

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Comparison of Biological Characteristics Between ‘Gala’ Apple and Its Early Maturing Bud Mutation

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Abstract: Biological characteristics of an early maturing bud mutation ‘Gala’ apple were compared with the normal one as the control. The results showed that the phenological period of the early bud mutation ‘Gala’ apple was mainly consistent with the normal ones but the mature period about 25 days earlier. The bud mutation had shorter tree bodies, more branches and lower growth rate of trunk diameter. The length of internode, the width and thickness of leaf were 1.07, 1.16 and 1.17 times than the control, respectively. There was no difference in the length of branch, leaf and petiole. The length and width of petal, lengthways and transverse of anther diameter, length and diameter of anthocaulus, germination rate of anther, and the size of corolla were 0.87, 1.16, 0.94, 1.14, 0.63, 1.49, 0.70 and 0.87 times than the control, respectively. The average fruit weight was 206.2 g, which was 25.3% higher than the control. The content of soluble solid, soluble sugar and soluble acid were 13.87%, 5.55% and 0.1%, which was 4%, 9% and 66.6% lower than the control, respectively. The sugar acid ratio was 56, which was 267% higher than the control. The fruit surface was covered with striped red equably. In conclusion, the early maturing ‘Gala’ was a mutation with excellent comprehensive properties.

Key words: ‘Gala’; apple; bud mutation; early mature; biological characteristics