Table 2. (9 hours). 4 hours heating up, 5 hours holding

HEATING FOR 5 HOURS			
TEMPERATURE (Degrees Celcius)	450	480	510
TAR			
Percentage of distillate (%)	69.833%	71.807%	68.938%
Percentage of Coke (%)	16.755%	15.276%	15.078%
FCC			
Percentage of distillate (%)	76.683%	81.547%	84.049%
Percentage of Coke (%)	10.721%	9.825%	9.165%
COAL PITCH			
Percentage of distillate (%)	32.974%	35.18%	37.344%
Percentage of coke (%)	47.46%	46.244%	44.4%

Equipment

Furnace, beam balance, desiccator cabinet.

Observation

Percentage of coke by weight decreased for all three samples when the operating temperature was increased. Percentage of distillate by weight also increased as temperature was increased. Coal pitch gave the highest yield of coke in both experiments. Comparison between the two experiments shows a much linear relationship for temperature and decrease in coke yield of the 9 hours of heating than the 5 hours of heating.

Conclusion

High temperatures favor cracking and this leads to the production of

- More distillate liquids
- Lower yields of coke and hydrocarbon gas

Hence coke formation is indirectly proportional to temperature at standard conditions.

Coal pitch gives higher percentage of coke than FCC and tar at similar conditions of temperature and pressure.

Coal pitch formed a coke with metallic appearance and strongly defined lines (needle coke).

References

1. *Sawarkar A.N., Pandit A.B., Samant S.D., Joshi J.B. // The canadian journal of chemical engineering, 2007.– 85.*

DEVELOPING OF ACYL ARYL GLYCOSIDES SYNTHESIS

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Aryl glycosides are common constituents of different plants that have biological activity and are often utilized as part of treatment in traditional medicine. Lots of useful properties of such plants are due to aryl glycosides of different structures, including their acyl derivatives in carbohydrate part of their molecules – acyl aryl glycosides.

Biological activity of these substances varies to some extent. A lot of them are known to be antioxidants [1], others have antibacterial activity [2], cytolytic, cytostatic, anticancer activities [3], etc. In addition, they are of a low toxicity [4]. Thus, acyl aryl glycosides can be implemented as medications, and to do so examination of their structure, activity, and side effects must be carried out.

The most common way to obtain these substances is extraction. There are a lot of different acyl glycosides known as extracted from raw material [5]. However, it is not very efficient, and tends to be expensive as the extraction requires kilograms of plant parts to give milligrams of product. To obtain the pure product from extract it should be separated

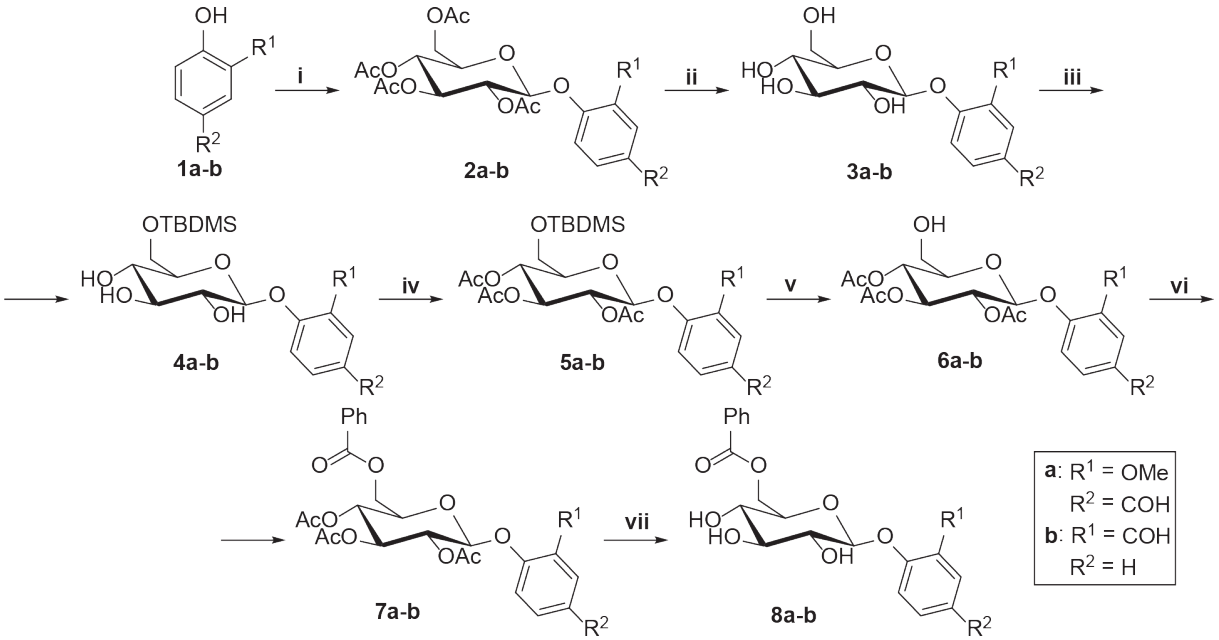

Fig. 1. *Synthesis of desired aryl glycosides: (i) – ABG, Acetone, RT, 24 h; (ii) – MeONa. MeOH, RT, 0.5 h; (iii) – 1.1 eq. TBDMSOTf, 2eq. 2,5-Lutidine, DMF (THF), RT, 24 h; (iv) – 3 eq. Ac_2O, 2,5-Lutidine, RT, 24 h; (v) – 80% AcOH, RT, 24 h; (vi) – PhOCl, Py, CHCl3, RT, 24 h; (vii) – $HCl/EtOH/CHCl_3$ (1 : 3 : 1)*

from other substances with similar structures and properties, and very often it is not 100% pure, and so cannot fully be utilized in further investigations. Moreover, the plant itself might be expensive or hard to be collected, or even protected from collection by law.

On the other hand, chemical methods are available for preparation of acyl glycosides. For instance, synthesis of 8a might be held with ABG (derivative of glucose), vanillin 1a, TBDMSOTf, and some phenolic acids. Thereby, this is relatively cheap way (compared to extraction) to obtain the desired acyl aryl glycoside. In addition, such procedure can be tweaked to give a required amount of product and thus can be scaled up to industrial processes. Besides, some glycosides might be utilized as chemotaxonomic markers [6].

Thus, in this work we developed a method of synthesis of 6–O–benzoylvanillinoside 8a and 6–O–benzoylhelicin 8b (fig. 1). The main idea of it is to acylate the 6–O glucose position. First way is straightforward acylation of deprotected glycoside. However, this is not selective reaction, and gives number of products and low yields of the desired 6–O glycoside [7]. The other way is to force the reaction to be selective by protecting all other hydroxyls except 6–OH.

For this to work out we decided to start synthesis from tetraacetates of vanillin 1a and salicylic aldehyde 1b by Michael reaction [8]. Obtained products 2a-b were then deprotected with sodium methylate to give vanillinoside 3a and helicin 3b. On the further step TBDMSOTf were applied in non-hydroxylic freshly distilled solvent in the presence of 2,5-lutidine to yield mono silylated at 6–O position substances 4a-b, which was performed as a one pot reaction with the next step of acetylation of those glycosides to obtain 6-TBDMS-2,3,4-triacetyl-O-glycosides 5a-b, and sequential deprotection of 6–O position with forming in situ acetic acid. Resulting 6a–b glicosides were acylated with benzoyl chloride to give 6–O acyl glycosides 7a–b, which were further selectively deprotected in the system of $HCl/EtOH/CHCl_3$ (1 : 3 : 1) [9] to yield the final 6–O–benzoylvanillinoside 8a and 6–O–benzoylhelicin 8b.

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References

1. *Chung S.K., et al. // Fitoterapia, 2015.– №106.– P.147–152.*
2. *Argyropoulou A., et al. // Phytother. Res., 2012.– №26.– P.1800–1806.*
3. *Sarıkahya N.B., et al. // Phytochem. Lett., 2011.– №4.– 415–420.*
4. *März R.W., et al. // Wien. Med. Wochenschr, 2002.– №152.– P.354–359.*

5. *Shah Z.A., et al. // Phytochem. Lett., 2016.– №17.– P.107–113.*
6. *Lindroth R.L., et al. // Oecologia, 1987.– №70.– P.144.*
7. *Richtmyer N.K., et al. // J. Am. Chem. Soc., 1934.– №56(11).– P.2495–2497.*
8. *Rayavarapu S., et al. // Sci. Rep., 2017.– №7.– 8309.*
9. *Belyanin M.L., et al. // Carbohydr. Res., 2012.– №363.– P.66–72.*

DATES PIT DERIVED CARBON NANODOTS INDUCE DNA DAMAGE

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Abstract

Carbon Nanodots (c-dots), as a type of "green" nanoparticle, can be widely applied in medical diagnosis, imaging and drug delivery because of its biocompatibility, fluorescence, and low cost. Recently food derived carbon nanoparticles demonstrated selective cancer cell growth inhibition, showing a potential as anti-cancer drugs [1, 2]. However, the detailed mechanisms of c-dots effect on cancer cell proliferation need further study.

Use the techniques such as western blotting, flow cytometry, cell viability assay, immunofluorescence (IF) microscopy, ROS assay, fluorescence absorbance measurements and Nanodrop spectrometer, the DNA damage in PC3 cells was detected by increased Gamma-H2AX protein upon treatment with date pits nanodots (D-c-dots) drug with cell-cycle dependent foci formation at G2/M phase. Moreover, D-c-dots induced changes in the levels of RAD51 and PARP-1 proteins, generation of reactive oxygen species (ROS), cell cycle arrest at the checkpoint, significant increase in total apoptotic PC3 cells than normal cells NRK and early apoptosis by Annexin V assay showed similar in PC3 and NRK cells. In addition, D-c-dots decreased pH of PC3 cells in culture suggesting an effect of nanoparticles on the acidity of the cancer cells. In vitro binding assay showed that D-c-dots decreased absorbance of DNA at 260 nm. Upon direct incubation with double strand DNA (dsDNA), D-c-dots absorbance spectra was also shifted, demonstrating the binding of nanoparticles to the dsDNA results in bi-directional effect on each other. Meanwhile, quantum mechanical calculation will be performed to study the interaction between dsDNA and D-c-dots and its pH dependence.

Consistent experimental results suggest that Date pits derived Carbon Nanodots induce DNA damage of cancer cells through interaction with dsDNA. Further analysis of mechanism demonstrated inhibition of cell growth through selective cell cycle arrest and increased apoptosis with pH changes. Thus, dates derived c-dots show potential as an efficient and low cost nano drug for cancer therapy.

Reference

1. *Xie Yingqiu, et al. "Inhibition of Cancer Cell Proliferation by Carbon Dots Derived from Date Pits at Low-Dose." ChemistrySelect 2.14 (2017): 4079–4083.*
2. *Xie Yingqiu, et al. "Dysregulation of YAP by ARF Stimulated with Tea-derived Carbon Nanodots." Scientific reports 7.1 (2017): 16577.*