

SELECTIVE OZONOLYSIS OF AN ENYNE DERIVATIVE.

THE SYNTHESIS OF CIS-JASMONE

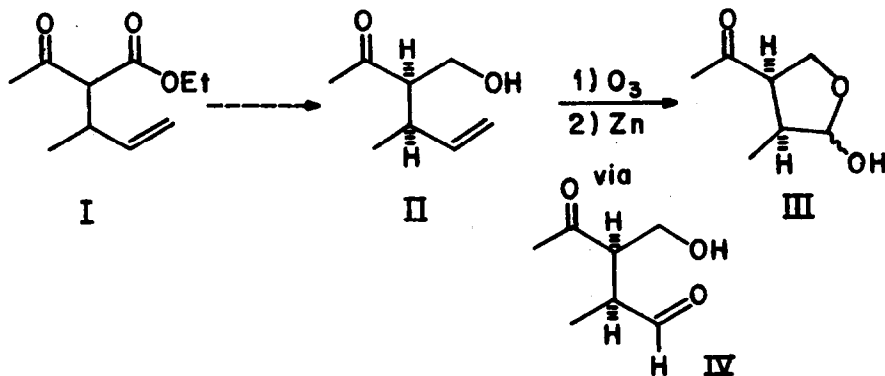
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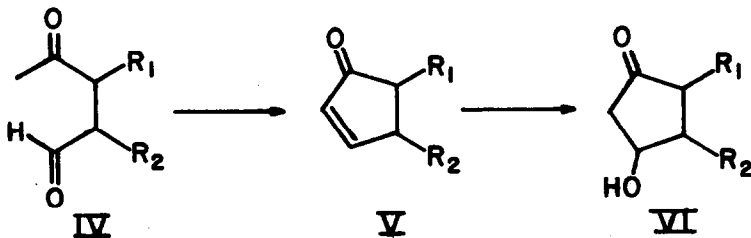
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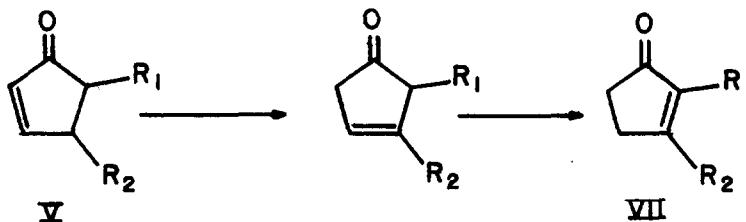
In a recent communication¹ we reported improved conditions for the preparation of compound I, and its conversion, via ozonolysis of the derived alcohol II, to the antibiotic botryodiplodin (III).^{2,3}



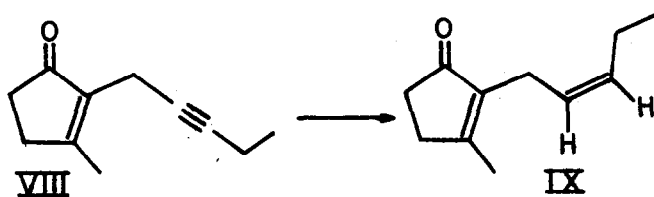
The use of compounds related to our intermediate keto-aldehyde (i.e., IV) for the preparation of prostanooids (VI) has also been the subject of current interest.⁴ Moreover,



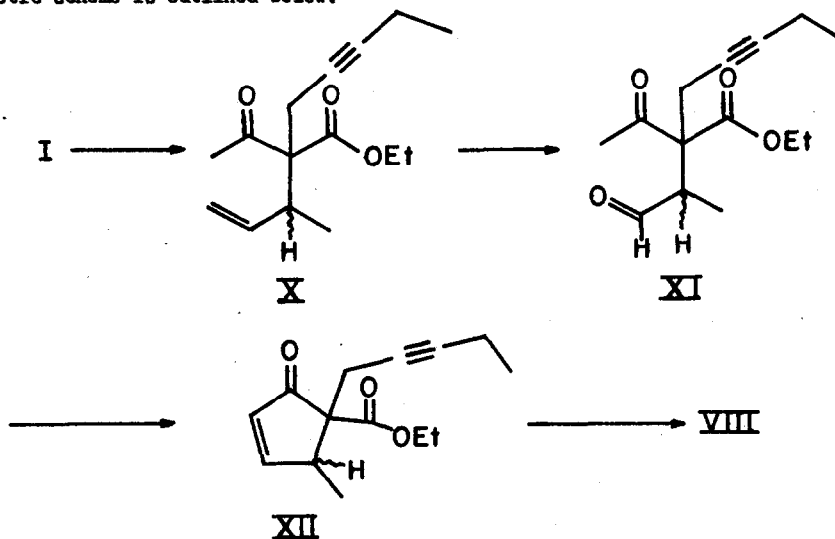
It is well known that 4,5-dialkylcyclopentenones (V) can be readily isomerized to the more stable 2,3-dialkylcyclopentenones (VII) via acid⁵ or base⁶ treatment. In order to extend



the ozonolysis-aldol route⁴ to cyclopentenones to include the preparation of acetylenic derivatives of VII, we now report the conversion of I into dehydrojasmine VIII, which is an immediate precursor of a *cis*-jasmine IX.



The synthetic scheme is outlined below.



The enolate of compound I (NaH/benzene) was alkylated with 1-bromo-2-pentyne⁷ (12 hrs, reflux) to produce the bis-alkylated acetoacetic ester X in 84% yield (b.p. 70° @ 0.05 mm). Treatment of X with ozone (-78°, CH₂Cl₂) yielded, after reduction (Zn/HOAc), the poly-functional aldehyde XI in 94% yield (b.p. 80° @ 0.05 mm). The amount of ozone is not

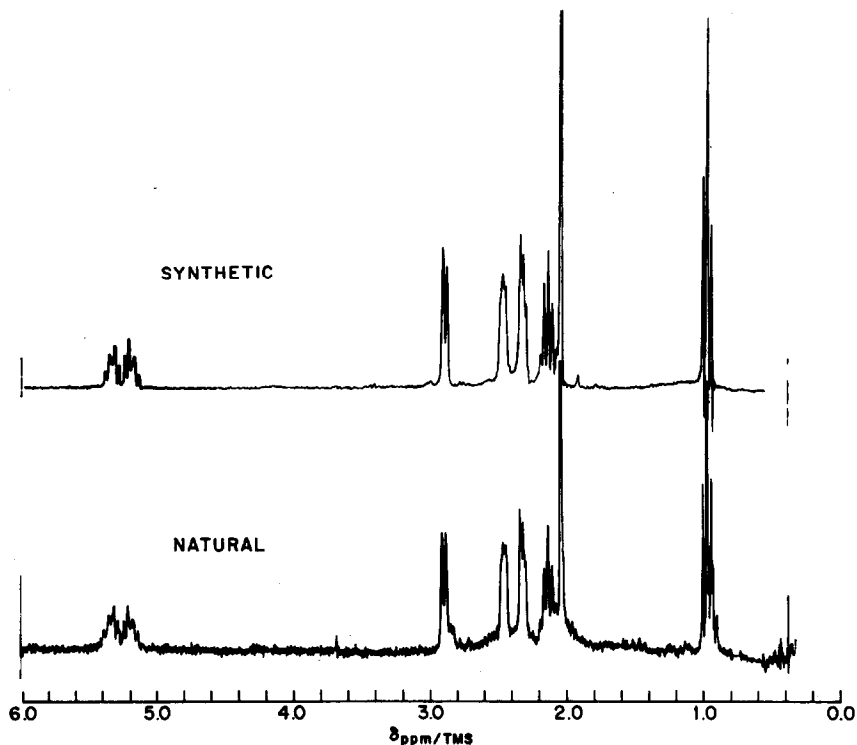


Figure 1. 250-MHz spectra (CDCl_3) of natural (top) and synthetic (bottom) *cis*-jasmone.

critical, and in fact, this yield was obtained when 2.5 equivalents of O_3 gas was passed through the methylene chloride solution. Cyclization was effected by treatment of keto-aldehyde XI with a catalytic amount of piperidinium acetate in benzene with continuous removal of the water produced (Dean Stark, 4 hrs, reflux). The cyclopentenone XII⁸ was obtained in 90% yield (b.p. $75^\circ @ 0.05 \text{ mm}$). Simultaneous decarboxylation and isomerization of XII (NaCl, moist DMSO, 160°)⁹ produced dehydrojasmone in 32% yield (b.p. $80^\circ @ 0.05 \text{ mm}$). The synthesis of *cis*-jasmone¹⁰ was completed by Lindlar reduction which produced material identical in all respects with a sample of natural *cis*-jasmone.¹¹ (See Figure 1 for 250-MHz spectra of synthetic¹² and natural *cis*-jasmone.)

This synthesis demonstrates that the ozonolysis of enyne derivatives represents an efficient method of preparing acetylenic carbonyl compounds which should have applicability in the synthesis of other natural products.

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8. Compounds I, X, XI and XII were all obtained as a 1:1 mixture of diastereomers.
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10. See K. Oshima, H. Yamatoto, and H. Nozaki, J. Amer. Chem. Soc. **95**, 4446 (1973) and references therein.
11. The authors thank Professor P. Greico for a sample of natural cis-jasmone (I.F.F.).
12. Our material was uncontaminated with a) the trans isomer (which is an impurity in the sample of "authentic" jasmone supplied to us, and with b) the trisubstituted olefin **ii**, which we have shown to be formed in 4% yield by the cyclization of the 1,4-diketone **i**, the most commonly employed route for the preparation of cis-jasmone (P. M. McCurry, Jr. and R. K. Singh, manuscript in preparation).